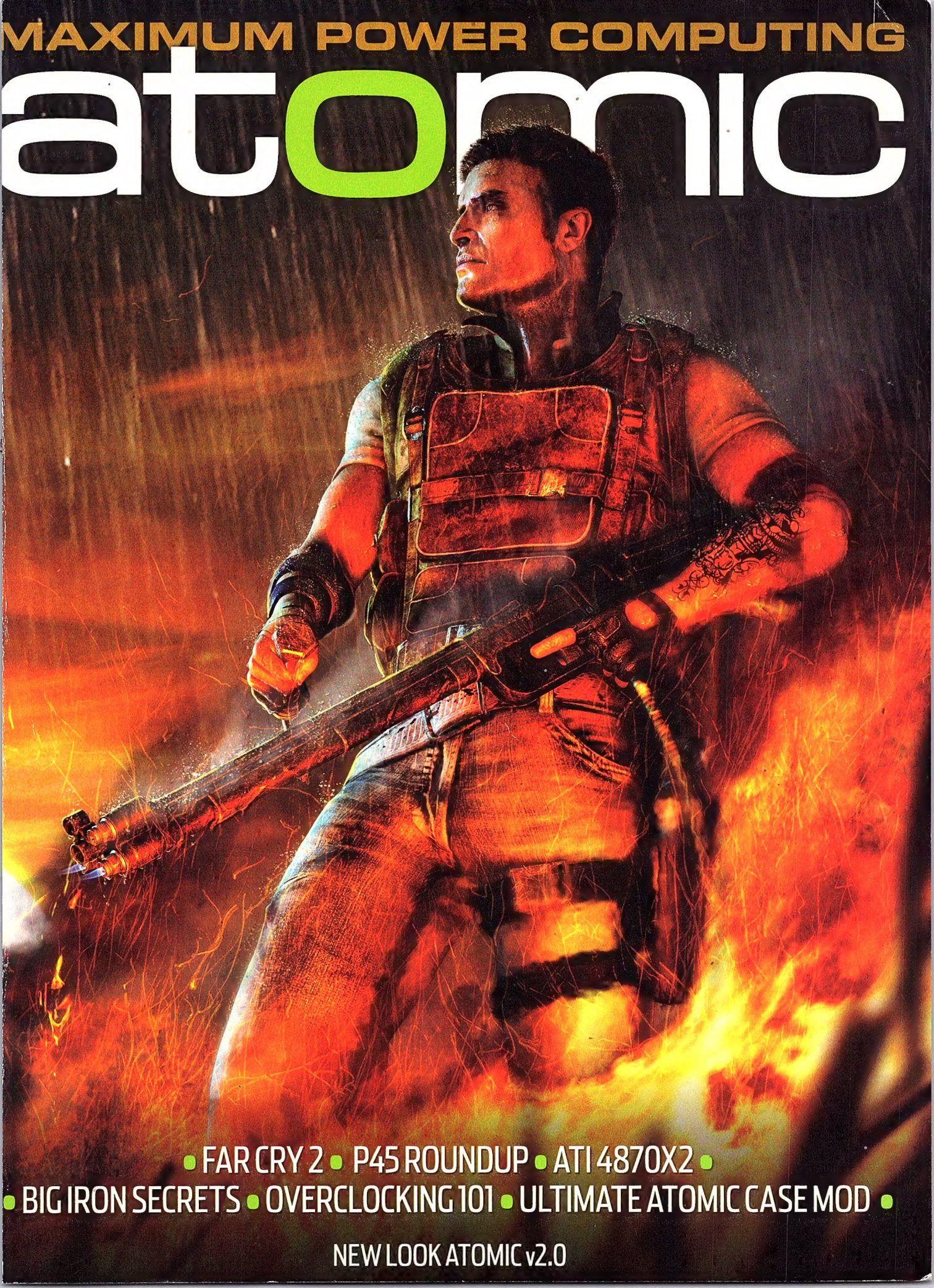


MAXIMUM POWER COMPUTING

atomic

A man in tactical gear, including a vest and armbands, is shown from the waist up, holding a rifle. He is looking upwards and to the left. The background is a fiery, orange-red environment with smoke and fire. The overall tone is dramatic and action-oriented.

• FAR CRY 2 • P45 ROUNDUP • ATI 4870X2 •
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What is Coming

DECLARE YOUR ALLEGIANCE



WARHAMMER ONLINE
AGE OF RECKONING



MYTHIC

ED HEAD

Also...

I can kill you with my brain.

Or, at least, I'll be able to once I work out just how to make OCZ's Neural Impulse Actuator to work properly. But hey, you gotta try new things every now and then...

You've probably already noticed that we are doing things a little differently around these parts. We've decided to bring the look and feel of Atomic up to date, to allow us to present to you a magazine that looks as sexy and sleek as the kit we review every issue.

For a while now we've been re-thinking our approach to tech, and to that end we've started including more peripherals, like gaming mice and speakers in our reviews. Similarly, with a new tech writer on board, we've re-thought a lot of our testing procedures, and in the coming issues we'll be cementing our methodologies in the pages of this magazine. On top of that, our Readers' Survey will give us the tools to make sure that our new-look mag contains the best possible content for all our readers.

I think we're quite possibly the best looking mag in Australia as of this issue, and it would be remiss of me to sit back and bask in the prettiness without saying a word or two about Atomic's designer, David West - he's done a marvelous job, I feel. Bravo, good sir.

But the magazine isn't the only thing that's different, this month. All things being equal the Atomic website - www.atomicmpc.com.au - will have gone live with a brand new

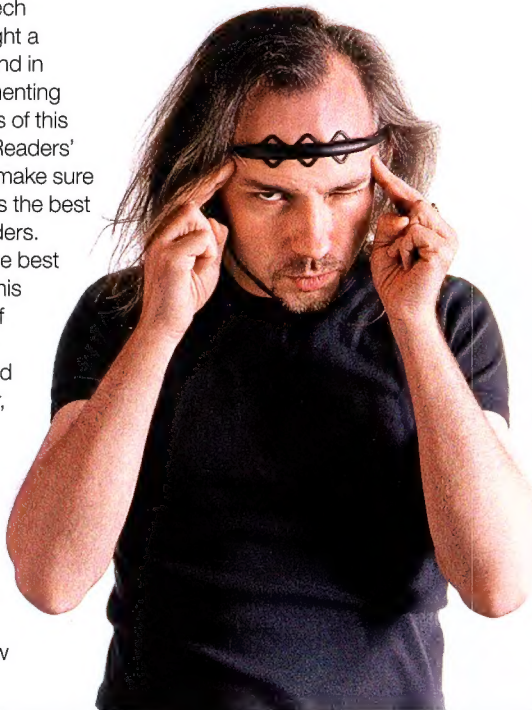
look as this magazine goes on sale. It's a sexy new look there, as well, with easier to browse content, more features, and a brand new forum that is faster and easier to use than ever before.

Quite simply, there has never been a better time than now to get into the fantastic Atomic community.

Anyway, stare as I might I can't get this damn Actuator thingy to type for me. Better go and keep practicing.

Enjoy the mag!

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We cannot accept responsibility for unsolicited copy and stress that it may take some time for a reply relating to these submissions to be sent out.

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Is Nehalem worth waiting for? Our man on the ground at IDF reports!

AMD has been talking of a graphics smack down against NVIDIA with its new 4870X2 card, but meanwhile Intel has been talking up several of its own potential smack downs.

Top of the list is Nehalem (the first iteration is called Core i7), the new wonder chip that Intel suggests will result in 8-threaded, 4-core performance bliss. The chip should be arriving in time for Christmas this year, but meantime we had the opportunity to see Intel put some Nehalem demo boxes through their paces.

Nehalem is a tricky beast to sum up – just saying “it’s a lot faster” would be ignoring some important points about the new architecture. The new chip is all about parallelism. In short, it’s built to make maximum use of the jump from four to eight threads.

Reliable independent benchmarks were thin on the ground when we wrote this, but the summary is that Nehalem will give relatively tasty (some blogs suggest 30 per cent) speed increases on multi-threaded tasks like video rendering and WinRAR compression. Intel’s own (and obviously biased) numbers have the chip blowing away Yorkfield systems.

To what extent we see those increases in games will depend on multi-threaded games

taking off. To this end, Intel wheeled out John Carmack, who waxed lyrical about ‘mega texturing’ and the prospect of offloading AI and physics onto separate threads with Nehalem (the demo he showed was of Rage).

(PC Authority has some more info here: www.pcauthority.com.au/News/120922,should-you-upgrade-now-or-wait-for-nehalem.aspx)

Just as interesting was Intel’s Larrabee project. Larrabee is well-off from appearing on desktops, but we know it will run standard DirectX and OpenGL, in addition to the ability for game developers to create special ‘Larrabee extensions’.

The key difference between Larrabee and today’s GPUs, is that all decisions about running threads in parallel are made in software, not fixed logic. Intel argues the end result for games will be better effects like fog, transparency and shadowing.

Other highlights at IDF included more Atom Eee PC clones than we could poke a stick at, 160GB SSD drives from Intel, and a wireless power demo (see: www.pcauthority.com.au/News/120402,intel-laptops-could-get-power-wirelessly.aspx).



Each month the moderators of the Atomic forums add up their collective wisdom (which doesn’t amount to much, really –ed) and pick the best posts and contributions to the site from amongst the community. This, then, is their story...

Dave’s a busy man. Six day weekends can really affect your working week. So much so that this month we (the mods) have removed all the porn from the toilet, tied Dave to his chair and poked him with cattle prods until we had his assurance that POTM would not only continue, but we get to award one every now and then. This month it’s our turn! Now we see why Dave’s been a tad slow at awarding POTM for the last couple: it’s hard, damn hard. So many great posts all over the forums but we did agree on a couple.

POTM for May was found in, of all places, Programming.

Sorcerer, half way down the page. Jaw dropping reply.
www.atomicmpc.com.au/forums.asp?s=2&c=10&t=4641

The decision was just as hard for the month of June.
We found it in 3D Design.

Xfu reminded us that there are so many people out there with much wisdom and more than happy to help when it’s needed.
www.atomicmpc.com.au/forums.asp?s=2&c=34&t=95

We love your work guys – keep it up!

The staff of the magazine now return you to your regularly scheduled programming...

The Dreaded 8.8

ATI’s newest Catalyst drivers are out, but initial testing shows there may still be some work to be done.

The newest 8.8 drivers for the Radeons have just been released over at AMD’s site (<http://ati.amd.com/support/driver.html>).

We’ve had them for a while, and we’ve been making the same crossfire-d and single configuration 4870 and 4850 cards jump through the same hoops we made them jump through in issue 92. Only they were being powered by Catalyst 8.7 back then.

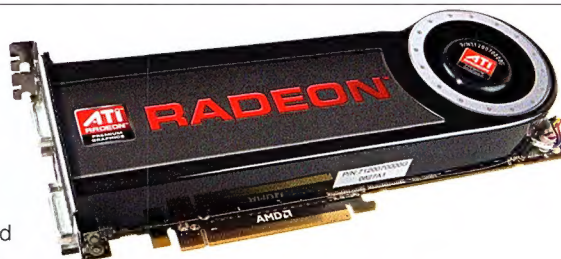
We assumed we’d see better performance and results would become incrementally better than the magazine had stated. But we think we might

be doing it wrong.

What to make of Catalyst 8.8? Odd things really. It returned worse results than 8.7 most of the time, and simply didn’t want to play with a pair of Crossfire-d 4850s. It’s unusual, and perplexing.

For a full table of our results, check out our site (<http://tinyurl.com/6bfosq>).

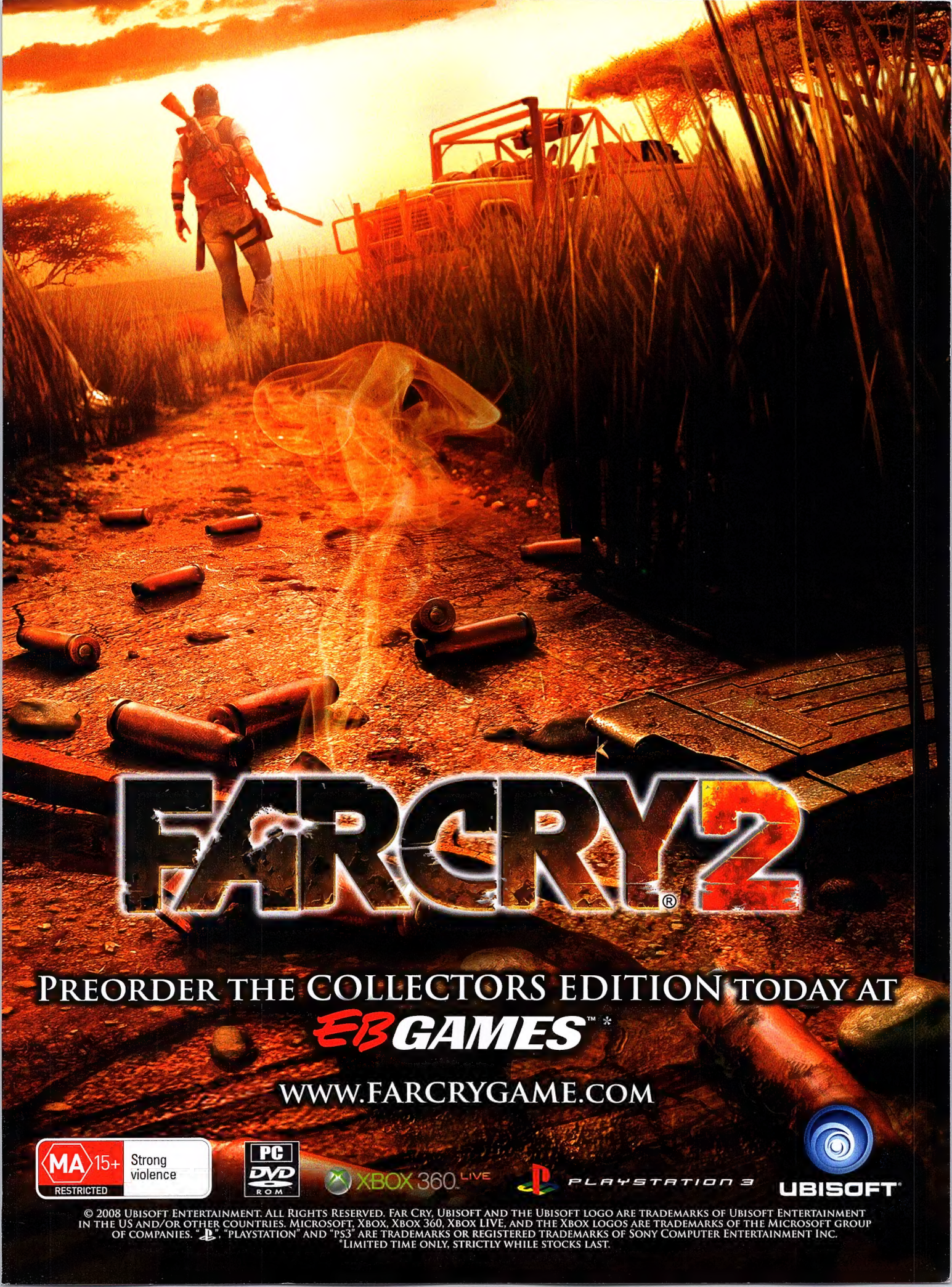
Something’s clearly wrong with either the drivers we received or our 64-bit test rig. We’re going to have a chat to AMD about this and find out what’s in the changelog and if we were testing a



buggy beta driver by mistake and scrounge around for any more info we can find. Certainly, initial feedback on our site suggested that we were not alone in having trouble with the 64-bit version of Vista.

Keep an eye on our website for more updates.

For what it’s worth, all the cards run a lot cooler and quieter under Catalyst 8.8 than they did under Catalyst 8.7. We take our joy where we can.

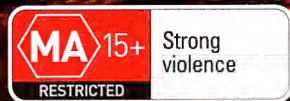
The background of the cover is a dramatic, high-contrast scene from the game Far Cry 2. It depicts a character in a combat suit and helmet, carrying a rifle, walking away from the viewer down a dirt path. The path is littered with several spent shotgun shells. In the distance, a military-style vehicle is partially visible. The scene is set in a savanna-like environment with tall grass and acacia trees under a bright, hazy sky. The overall color palette is dominated by warm, orange, and brown tones, creating a sense of a harsh, war-torn environment.

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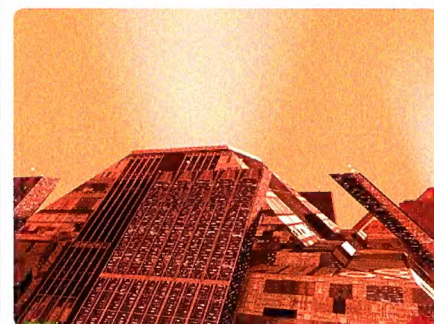
Cyberpunk arcologies, here we come



A Dubai-based environmental design company has come up with a futuristic vision for housing the teeming masses of our crowded future cities. Ziggurats.

These pyramid-like mega buildings take up 2.3 square kilometers and can house 1.1 million people. The entire structure is designed from the ground up with modern technology like biometric security and an integrated 360 degree capable transport system – no more cars! In fact, by using steam power and wind turbines, the entire edifice is claimed to be practically carbon neutral.

But what really gets us excited is the fact that it looks so much like the Tyrell Corporation headquarters from *Bladerunner*. All we need now is replicant super-soldiers and flying cars, and we may still be able to make the 2019 deadline for the best dystopian future ever.



MMO Madness

The massively multiplayer market is still growing. More DoTs!

If you doubt that the MMO is the dominant PC gaming genre, the next few months are going to see that doubt put to the test.

There's a slew of new releases and important updates coming for the big players on the scene, and not doubt the biggest has got to be the *Wrath of the Lich King* for *World of Warcraft*. The beta testing of the new expansion is well underway, and early reports suggest the game is about to undergo a swathe of changes. Aside from the new Deathknight epic class, many classes are undergoing some serious re-thinks, while XP rewards are looking to be tweaked ever higher so that players can rush through to the new content.

The devs behind *Age of Conan* are also hinting at a new expansion around the corner, while also promising a host of fine-tuning and fixes to bring the current game up to snuff. The game has had a rocky road, but is beginning to shape up. *Dungeons*

and *Dragons Online* is also launching a new content pack, which will also make a lot of big changes to the game. Finally, the first expansion for the sleeper hit *Lord of the Rings Online* is coming, and virtual version of Tolkien's Middle Earth is already undergoing a lot of changes in anticipation of finally getting down into *The Mines of Moria*.

Finally, there's another big new launch just around the corner. We've covered the news – some good, some bad – swirling about *Warhammer Online: Age of Reckoning* up to now, but by the time you read this, we'll be in the beta. For weekly reports of how the game is shaping up (and for weekly *Wrath of the Lich King* blog) check out:

WWW.ATOMICMPC.COM.AU



Move over Wikipedia, there's a new king of the information hill. Members of the Long Now Foundation have just completed a mighty task – creating a modern version of the Rosetta Stone. It's actually three-inch disk made of non-corrosive material, with 1,000 translations of the Bible's Genesis, word lists, the UN declaration of human rights and other important linguistic data to assist in translation in the far future of humanity. The data is not digital, either, but rather scanned in using a special process so that when magnified 1,000 times, it becomes human-readable.

www.rosettaproject.org

SHORT CIRCUITS

Yet another great but poorly executed idea bites the dust! This time it's *Dungeon's* and *Dragons* owners Wizards of the Coast's Gleemax social networking site (www.gleemax.com). In theory, Wizards wanted the site to be a hub for roleplayers to gather, meet and game online. Sadly, for dice rollers everywhere, the site simply wasn't delivering the promised features and functionality, nor the hoped for numbers.

ASUS ROG Rampage Extreme

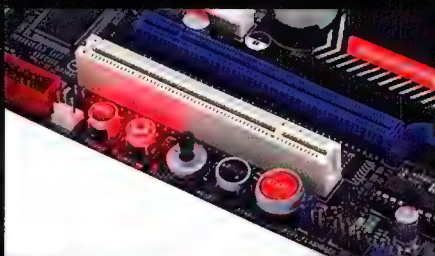
Get the Gaming Edge with Over-the-top O.C.

Enjoy Unprecedented Gaming Performance with TweakIt, Extreme Engine and Fusion Block System

Designed for gamers who spend lots of time under their PCs' proverbial hoods to coax every ounce of performance from their hardware through mods and tweaks, the ASUS ROG Rampage Extreme is a cutting-edge overclocking platform that bears testament to the Republic of Gamers' uncanny ability to grasp what hardcore gamers crave for, and deliver a product that exceeds those expectations.

TweakIt

Let Your Fingers do the Tweaking

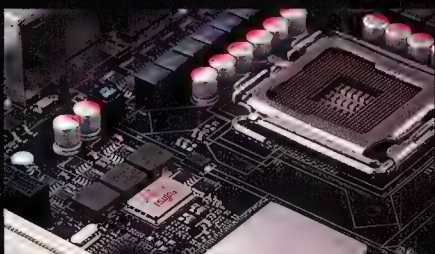


Hardcore overclockers have been clamoring for a quick and intuitive means of fine-tuning their hardware performance outside of the BIOS or OS, and ASUS has responded in the form

of a fully exclusive, highly innovative and incredibly handy feature known as TweakIt. By manipulating a joystick-like control and toggle/confirmation buttons built directly onto the motherboard, users can control the performance optimisations while they play games. Without requiring users to access the BIOS or OS every time a change is desired, the process of finding the system's overclocking sweet spot is greatly sped up.

ROG Extreme Engine

Overclock with Absolute Confidence



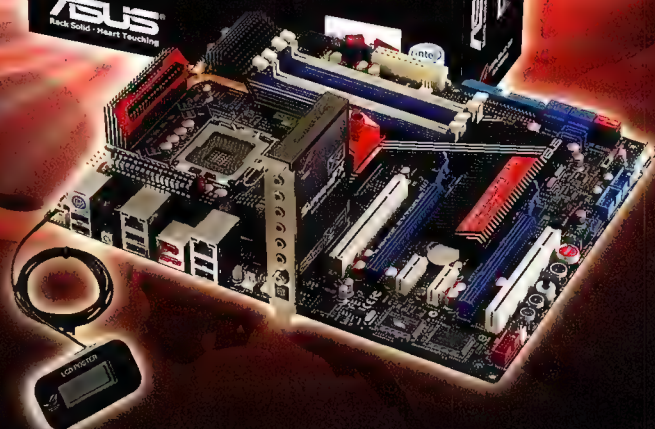
At the heart of the ASUS ROG Rampage Extreme's exceptional overclocking prowess is the ROG Extreme Engine, a next-generation dynamic multi-phase power management system.

Equipped with high performance ML Caps (Multilayer type Polymer Capacitors) located at the CPU, Memory and Northbridge, the ROG Extreme Engine provides a consistent power supply during overvoltage by lowering ESR (Equivalent Series Resistance) – ensuring that mission-critical components remain stable and reliable when venturing into high voltage options in the BIOS.

Fusion Block System

Optional Cooling Solutions for Stable O.C

In order to keep Northbridge, Southbridge, and VRM temperatures low when dabbling in extreme O.C, the ASUS ROG Rampage Extreme comes with an optional thermal kit that can be installed to enable better heat dissipation. Comprising a removable MOS heatsink, Northbridge heatsink and optional fan, this customisable cooling option works on the back of ASUS' existing Fusion Block System – creating the most versatile, efficient, and advanced onboard thermal system in the world.



GEARBOX

All the best and coolest gadgets and gear!

1. Sennheiser MX-W1 earphones

Price TBC Website www.sennheiser.com.au

The invention of in-ear headphones was a revolution for those seeking a stealthier way to ignore people talking to them, instead listening to hot tunes or the deep, mellow spoken word of Richard Harris. Or, well, anything, really.

Now, Sennheiser has delivered a veritable quantum leap in ignoring-tools technology – wireless in-ear headphones! That's right, with the right hair style you can now easily hide just how rude you are, without tell-tale wires giving lack of manners away. These neat little 'phones can also operate for up to 12 hours, using in-phone batteries and charging from the handy carry pouch, which itself has a battery. That's a lot of blissful ignorance right there.

2. KINGMAX Super Stick

Price \$60 (for 8GB version) Website www.protac.com.au

Everybody knows the storage mediums are all universally capable of storing more data as they – at one and the same time – get smaller and smaller. It works for books (compare a hand-illustrated bible with your average modern encyclopedia), hard drives (tape drives to laptop HDDs) and even flash drives.

Case in point is the tiny but huge KINGMAX Super Stick, which despite its miniscule form factor comes in 1GB to 8GB models. This thing is small, like, my cat has bigger fleas, small. We're talking 34mm by 12mm and only 2mm thick small. Thankfully, it also comes with a neat accessory to stop you losing it, called the 'jelly doll pocket'. Which, we promise, is not some Real Doll accessory.

3. OXX Digital Classic 600

Price \$299 Website www.oxxdigital.com

Sometimes you don't want to take your tunes with you, but you do want to listen to a lot of them. And from all over the place! If that's what floats your musical boat, then the OXX Digital Classic 600 internet radio is just the thing for you!

The Classic 600 is both sleek and stylish and easy to use. It connects to servers in Europe or the UK using your wi-fi connection, and gives you access to over 12,000 radio stations. You can operate it using 12 different languages, and it also doubles as a media player (that supports Real Audio, Microsoft Windows Media, MP3, AU, AAC (unprotected), WAV, AIFF and

Ogg Vorbis), FM Radio, clock, sleep timer and alarm clock.

4. Samsung S2 Pebble MP3 player

Price \$49 Website www.samsung.com.au

We all like a tune or three around the office, and being able to take your tunes with you – on the road, is it were – is always kind of nice. Handy, too, if your mobile tune-or-three-machine is a stylish little unit that won't look out of place if you wear it like a piece of jewelry.

The S2 Pebble hits nearly all of those points, and a few more, and as much as we like it's stylish design, we do have two gripes. Firstly, controlling your tracks and listening pleasure using four controls and a single, three-colour LED is like trying to control a runaway truck with a piece of cooked spaghetti. Secondly, don't ever drop this in a rock garden.

5. QNAP NVR-1012 Network Surveillance

Price \$999 Website www.qnap.com

In the SF classic *Strange Days*, a character opines that it's not a question of whether you are paranoid, but rather a question of if you are paranoid enough. With this piece of eye in the wherever-you-want-it-to-be tech, you are definitely paranoid enough.

"The NVR-1012 kit is an ideal solution to provide day & night protection to your home or office," says Kieren Kemm, Senior Product Manager from Bluechip InfoTech. "The unique infrared designed on the camera included in the kit is enabled automatically during the night time to ensure continuous recording and monitoring."

Which means it's particularly handy if, like *Strange Days*' Tom Sizemore, you really want to release your own secret sex tape. But I digress.

The NVR-1012 boasts live real-time monitoring, capture on alarm, trouble-free setup and effortless maintenance.





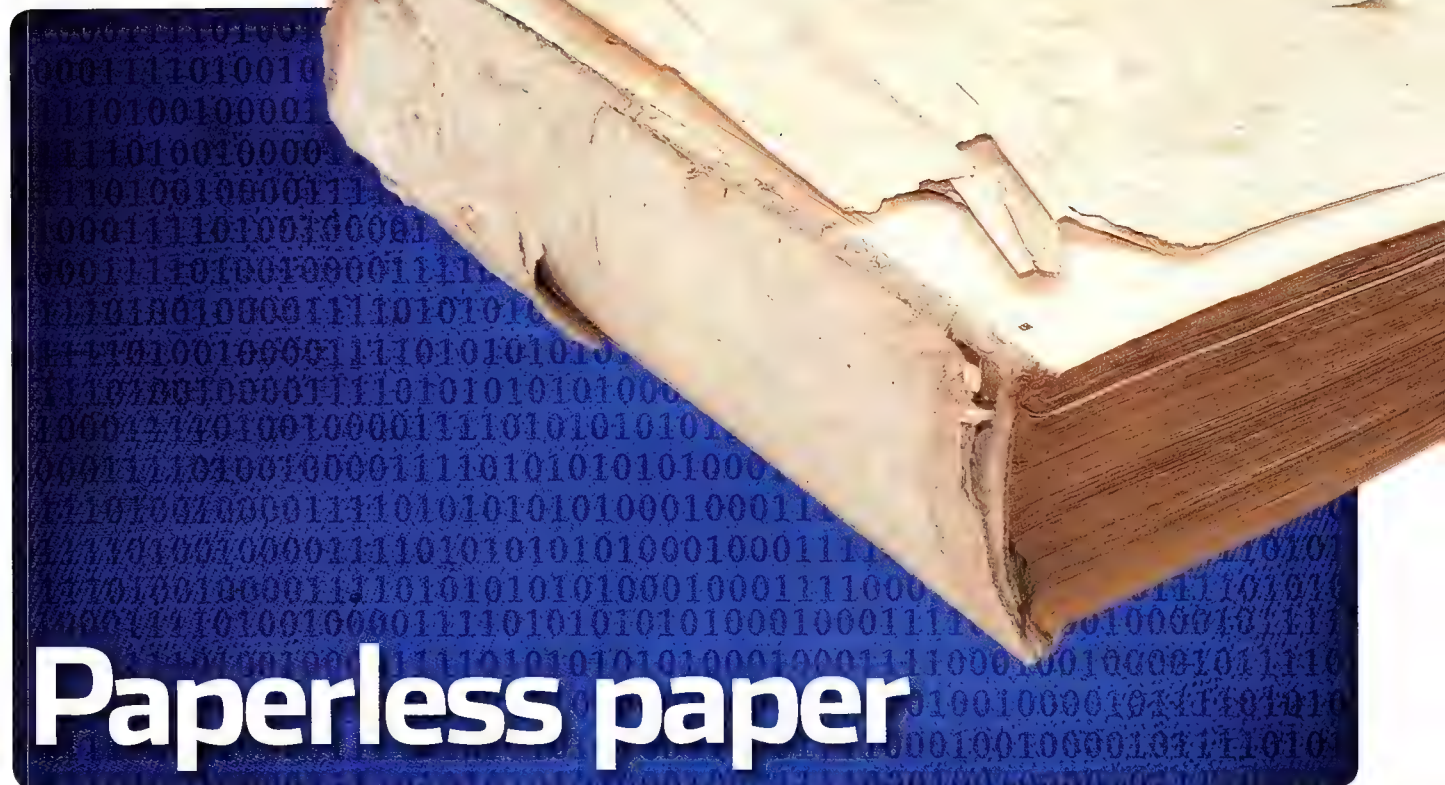
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Paperless paper

Whatever happened to the paperless office or, indeed, the paperless world? Perhaps it's closer than we think. **Ashton Mills** counts the pixels.

It's interesting to muse that, since PCs became ubiquitous, we've gone from transferring the letters on our pages to the letters on our screens and – pretty soon – back again. The concept of electronic paper isn't new, but it is growing as a technology. And while PCs didn't bring us the paperless age they apparently promised (if anything we use more paper now than we did in the past) the advent of electronic paper may do what PCs didn't, and replace paper as a printed (or should we say rendered) medium.

It's all rather cool, of course, but the viability of e-paper is dependent on a wealth of factors, not the least of which is production cost. So just where are we at the moment with this wonderful technology, and how does it work its magic?

Particles and pixels

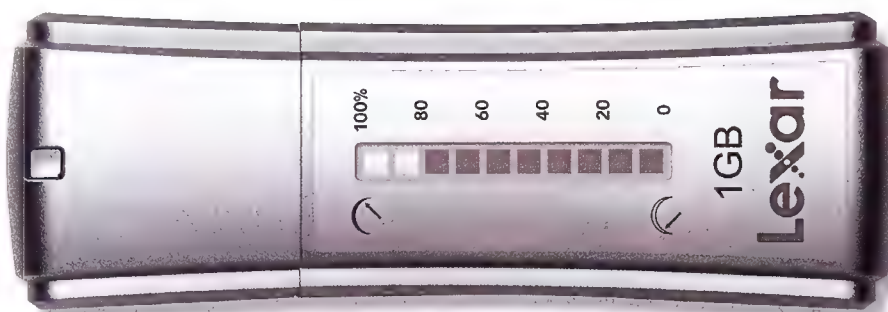
There are currently a number of methods to produce electronic paper, but the two most prominent include E-ink and Xerox Parc's 'Gyricon'.

Each uses a similar principle, but implement it differently.

E-ink specialises in a method known as *electrophoresis* that works by rearranging pigment particles via an electrical charge. In the case of E-

ink millions of microcapsules (aka pixels), no larger than the width of a human hair, are arranged in a honeycomb structure and sandwiched between two electrodes to form a thin electronic paper film. Each capsule contains a clear liquid suspending both negatively-charged black carbon particles and positively charged white titanium dioxide particles. When a charge is applied, one set of particles is attracted to the visible surface while

"About the only thing lacking from electronic paper at the moment is good colour reproduction, something that's being worked on..."



the other is attracted to the backplane. With E-ink's method it's possible to not only generate black and white states using this for each capsule, but also gradients by applying mixed charges.

Currently, the response time for particles switching sides is around 250ms, but with enough voltage can be as fast as 50ms. However rate of change isn't what's important when it comes to electronic ink – after all, unless there were embedded video (entirely possible) in your e-news paper you're going to be looking at static text and images. What is important, however, is power and longevity.

Unlike LCD screens, E-ink film has no backlight

Lexar's Mercury USB drive uses E-ink for its display.



E-ink's technology uses millions of tiny capsules arranged loosely in a hexagonal structure.

and instead reflects ambient light much like paper does. And, once a charge is applied, it's possible for the capsules to retain their state for years. Both of these features make it possible to, in literal terms, create a viable electronic alternative to paper, with one important difference: the pages can refresh themselves to contain entirely different information.

Xerox Parc's Gyricon solution is similar but instead of using charged particles, tiny bichromal hemisphere (black on one side, white on the other) beads float in oil and are free to rotate depending on an applied charge. Somewhat like

an Etch-A-Sketch, Gyricon paper can be fed into a printer which can erase and render a new image – so it's not unlike feeding paper into a printer as you do now, except you have a single piece of paper that can be re-used thousands of times.

The boffins at Xerox Parc envisage spin-off applications like an electronic hand-held 'wand' that can paint an image across electronic paper as it's waved over the surface and, in reverse, read an image from the paper: aka a scanner, copier, and printer all-in-one in the palm of your hand.

It's this kind of thinking that makes you realise that while the impetus for these technologies may have been flexible, electronic, displays the future could hold a wide range of spin-off technologies.

For now both solutions provide other benefits apart from the obvious – compared to current LCD displays they have a much wider viewing angle, require power only to change their contents but not to display them, produce a truly 'solid' image that doesn't need to be refreshed and is easy on the eyes, and can be eminently flexible (allowing for some innovative devices – like a small notepad reader that can be 'unrolled' from a tube like a scroll).

About the only thing lacking from electronic paper at the moment is good color reproduction, something that's being worked on for the future, and will likely employ color filtered capsules for red, green, and blue that work much like LCD pixels to create color.



Motorola's FONE F3 is the first mobile phone to use electronic paper as a means to extend battery life.

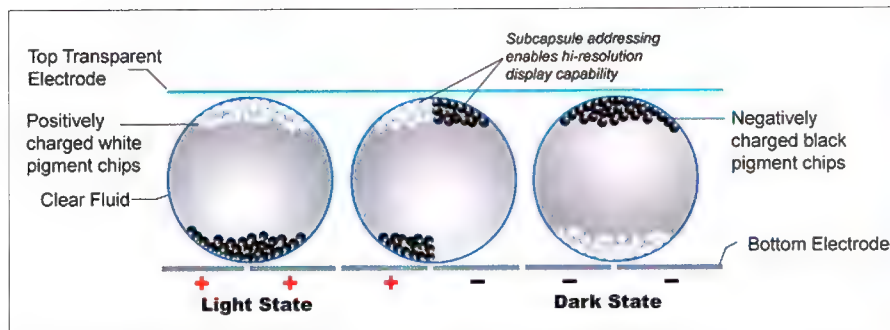
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Positively and negatively charged titanium dioxide and carbon particles switch sides when a charge is applied.

Current uses and future

Uses of electronic paper as it stands today are many and varied. Obviously we can have digital books, or rather book readers, like Amazon's Kindle that debuted last year, as well low-power portable displays for everything from USB keys (see Lexar's Mercury JumpDrive) and watches through to billboard advertising. Ostensibly, as a film it could be easily integrated into wallpaper to

The shape of this future depends, of course, on production costs that will reduce as the technology continues to evolve and, on a tangent, the ancillary technologies any display needs – control circuitry, and power. And funnily enough, both of these are well underway as well – see the sideboxes 'Paper Power' and 'Paper transistors'.

All up electronic paper is one of those innovative inventions that will slowly change the way we live. Widespread use may be a while away yet but

"The shape of this future depends, of course, on production costs that will reduce as the technology continues to evolve..."

Paper Power

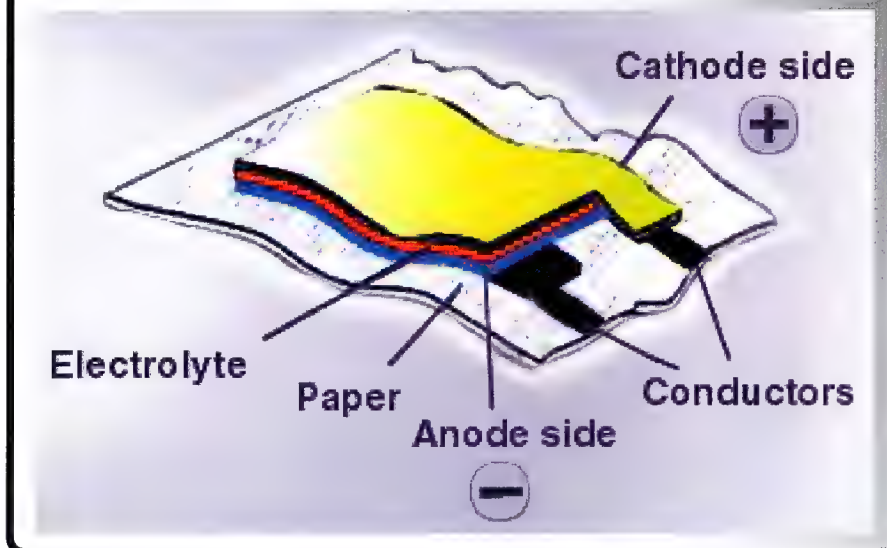
It's all well and good having thin, flexible, displays but what about the electronics and power sources that go with them? In terms of power, an Israel-based company by the name of Power Paper has a solution, and it doesn't get any simpler than this: printable batteries.

Power Paper's paper batteries work just like a normal battery, but use zinc and manganese dioxide inks as the cathode and anode, which are printed via silkscreening onto paper, or other fabrics. As these are considered

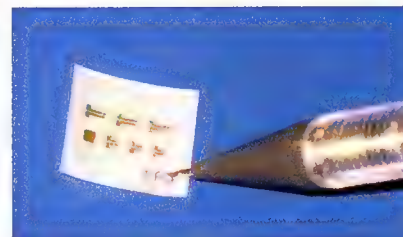
'dry' batteries, they also don't need casing to contain them.

The result is a battery as almost as thin as paper and, more importantly, just as flexible, making it possible to integrate them into everything from portable devices to clothing.

Currently, Power Paper uses its technology in a range of its pharmaceutical products that require small embedded power sources, but there's no doubt we'll find this technology in all manner of devices in the future.



Paper transistors



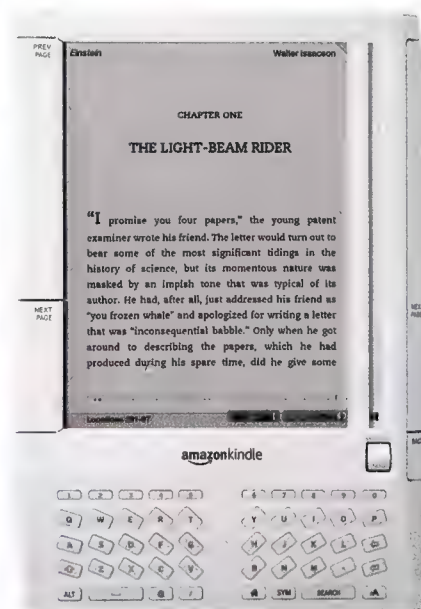
With flexible screens, and flexible power sources (see Paper Power sidebox), what's left for a future of truly flexible technology is – at least as a building block – a means to produce flexible transistors.

Which is precisely what some smart researchers at the Centro de Investigação de Materiais in Portugal recently produced – the world's first paper-based field-effect transistors (FETs).

Using paper as the dielectric layer for oxide field-effect transistors, the research team fabricated transistors on both sides to create both an electric insulator and a substrate for the transistors, and a world first in the process. According to the team the performance of the paper transistors is better than current state of the art oxide based thin film transistors (TFTs), to boot.

Interestingly, the motivation for the use of paper -- or rather its cellulose composition -- is the status of cellulose as the world's main biopolymer, making it a cheap and abundant source for building flexible electronics.

the applications of low-power, permanent, flexible displays are far too tempting to let slide. We built our world off the knowledge recorded on paper; it will be interesting to see where the next evolution of it takes us. (E)



Amazon's Kindle e-book reader uses electronic paper.

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I/O OF THE MONTH

Cluster-frack

I As far as I know, the bigger the cluster, the faster your hard drive can read a file, and the less fragmentation?

I brought a whopping great 1Tb Seagate server-edition HD, which I am planning to use only for files which are from 50mb to several gigabytes in size. I am using Vista Ultimate 64-bit SP1 at the moment. What's the best allocation unit size to increase performance?

Will

O Very few PC tasks will run any faster if you increase the NTFS cluster size from the default four kilobytes.

You can go all the way to 64 kilobytes if you like – some partition-management apps, like Acronis Disk Director, let you change the cluster size quickly without reformatting – but only in unusual circumstances will this make any perceptible difference.

Disks that've been converted from FAT32 to NTFS are a special case. They'll have a cluster size of only 512 bytes, which actually will at least slightly reduce performance. If a file can fit in a single cluster, then it's impossible for that file to be fragmented, which means at least one less seek operation when the computer reads that file. So if your cluster size is very small, then pretty much everything will be fragmentable – though the system will still write files to contiguous clusters as much as it can.

512-byte clusters will also bloat out the NTFS Master File Table (MFT), with eight times as many entries as 4Kb clusters would require.

There's a bit more to this, though, which you'll discover if you start looking into the amount of 'slack' space that exists on an NTFS volume. Slack space is the wasted space between the end of a file's actual data, and the end of the last disk cluster it occupies. Only one file can have data in any given cluster, so the slack space at the end of the file is wasted. On average, the slack space on a given drive will be one-half of the cluster size times the number of files. Windows makes it easy to see these numbers, in the Properties page for any collection of files; 'Size' is the actual byte-size of whatever you selected, while 'Size on disk' is the amount of disk space the files take up,

including the slack.

On NTFS disks, though, the slack will be smaller than you'd expect. My C: drive, for instance, is an NTFS volume with the default four-kilobyte clusters, and it at the moment contains 106,123 files. A simple estimate therefore gives two kilobytes times 103,123 of slack space – about 207 megabytes.

The actual byte-size of the files is 313,990,941,886 bytes, but the 'Size on disk' number is only 314,062,303,132 bytes. The difference between those two numbers is only about 68 megabytes. That's about a third of what the simple estimate suggests.

This is because NTFS will actually store the whole of a small file in the Master File Table, if the file itself is smaller than the normal MFT data for that file would be. This reduces seeking and makes things faster.

The storage capacity of the MFT remains at around 750 bytes per file no matter how big the cluster size is, though. So as NTFS cluster size gets bigger, the actual slack space will get closer and closer to the simple estimate.

If you've got some oddball application that makes vast numbers of files that are all smaller

I/O OTM

WINS A LOGITECH G5!

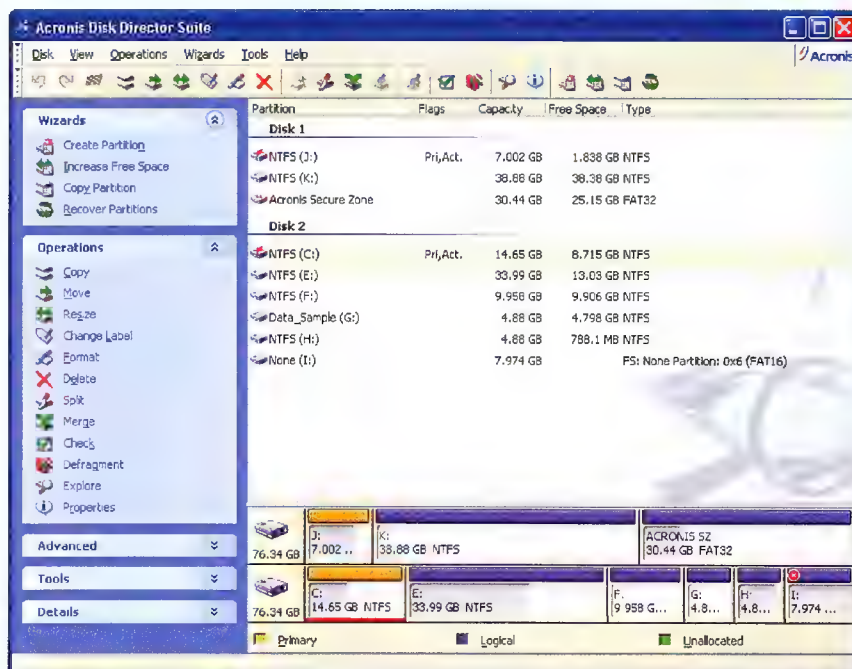
There's a mouse in the house. Okay, it's not in the house, it's in I/O. And it looks damn good.



than the maximum possible cluster size, but bigger than the default one, then setting the cluster size big enough that every one of those files will be able to fit in a single cluster will make disk access faster. This is probably not your situation, though.

NTFS cluster sizes larger than four kilobytes also, by the way, make it impossible to use the NTFS compression feature. Compression can actually improve disk performance on modern computers with CPU power to burn, especially for often-read, seldom-written things like application data.

Compression won't do any good with incompressible data, though, so there's no point turning it on for a drive that's full of already-compressed image or video files.



Just start clicking at random. What could possibly go wrong?



To upgrade your IBM 704 from four kilowords to 32, just copy the magnetic core subframe from the 32-kiloword version!

Also, align your computer north-south

I Apparently, "A Chinese hacker has managed to crack the maximum memory limit imposed by Microsoft on 32-bit Windows Vista. The trick is to transfer or transplant the more memory support feature in 32-bit Windows Server 2008 to Windows Vista, which uses similar kernel code. Replace and overwrite the Windows Vista version of pkeyconfig.xrm-ms and tokens.dat with the version copied from Windows Server 2008."

More here: tinyurl.com/5jayqr

Some people even claim that only one file needs to be replaced to do the trick.

Is this for real?

Jurgen Sasse

O I don't know whether this works or not. But if it does, all it's doing is enabling full Physical Address Extension (PAE) in 32-bit Vista. This is probably not something you want to do.

32-bit Vista, like 32-bit Windows XP SP2 and later, doesn't really support PAE. You can turn PAE on, but you won't then actually be able to address any more memory. The only reason to turn PAE on is if you want to activate the no-execute (NX) or execute-disable (XD) features of modern CPUs. That's all PAE does on these operating systems.

The reason why PAE in XP and 32-bit Vista doesn't expand the memory map is that for a computer to work with PAE, all of its kernel-mode drivers need to be PAE-aware. If any of them aren't, the computer will hang.

Microsoft gave up on ever having enough PAE-aware drivers for mainstream WinXP computers, which is why, as of SP2 back in 2004, they abandoned the larger address space and changed the PAE mode for the mainstream 32-bit versions of Windows. Now it only gives you the same 4GB maximum memory as non-PAE mode. Non-PAE-aware drivers then work fine.

Since 32-bit Vista is not meant to have a full-address-space PAE option, I imagine that many of its kernel-mode drivers – quite possibly including standard Microsoft ones – will also not be PAE-aware. So all sorts of important stuff will fail, and you probably won't even get to the Windows desktop.

If you can set the system up with nothing but PAE-aware kernel-mode drivers, then 'full' PAE would work just fine. But I'd be surprised if you could actually do that, and I'm doubtful about whether this hack actually activates full PAE anyway.

Just get 64-bit Vista in the first place. It pretty much works, these days.

The Windows-key poltergeist

I Sometimes I come back to my Windows XP computer, and the Windows key is stuck down. So if I press E I get a new Explorer window, if I press L the computer locks, and so on.

Apparently this can happen because of some Terminal Services stuff or something; I'm not running Terminal Services, but whatever. The same pages that told me that also said that you can cure it by just pressing your Windows key a couple of times.

The killer is - MY KEYBOARD DOESN'T HAVE A WINDOWS KEY! The only way I've been able to fix the problem is by rebooting.

WTF?!

Luke Morris

O Use the On-Screen Keyboard, Luke.

Start > Run (or just R, since your computer's convinced the Windows key is down...), and type 'osk' and return.

(Fortunately, Windows-O, Windows-S and Windows-K aren't used for anything.)

Now use the mouse to click one of the OSK's Windows keys.

Windows treats this exactly like pressing the physical key. Now your phantom pressed key will be unpressed once more.

I Can't Believe It's Not A Battery!

I Do you know of a device that would replace two AA batteries with mains power? By that I mean a sort of dummy pack that would be inserted in place of the batteries, and plugs in? I'm thinking no, especially after about an hour of looking. If you know and have a minute I would sure appreciate your insight.

Greg Smith

O No, I don't know of any off-the-shelf way to do this.

It wouldn't be difficult to make, though. All you'd have to do is connect a 2.4-to-3-volt regulated plugpack to a couple of dummy batteries, with the output terminals in the right place to make contact in the battery bay of the device.

(The "regulated" part is important, by the way. Modern lightweight switchmode mains adapters should all be regulated, and thus not give a higher output voltage when lightly loaded, but it's still a good idea to check the unloaded output with a multimeter, if you're not quite sure.)

You actually can buy dummy batteries off the shelf, though they're not very easy to find. Making them is no big deal, though – pieces of wooden dowel plus nails or thumbtacks for terminals will do the job.

Note that if you want to put the battery cover back on after installing a contraption like this, you're probably going to have to cut some sort of notch in the cover for the wire to pass through.

It's also often possible to get a good connection with battery-bay contacts by using alligator clips or integrated-circuit test clips, thus avoiding the dummy-battery problem entirely.

Or you could just hard-solder wires to battery-bay contacts, and attach an inline barrel socket or something to the end, so you can plug a normal wall-wart straight in. ☺



Now, Igor, we need only wait for the lightning to strike!



Size matters

Ashton Mills feels that games are being held back. And he knows the culprit!

In the inevitable race between the chicken and the egg, the development of higher quality gaming is played out between higher-resolution textures and available GPU VRAM. In so many ways we've seen leaps and bounds in gaming engines these last few years that give us beautiful games, and yet they remain hobbled by the available technology – oh, we have shaders and pipelines and cores to spare, but VRAM has shifted ever so slowly.

And it's about time it shifted. For quite a while now 512M cards have been the de-facto, and frequently less for cheaper cards. But invariably, engines have been pushing

There's a reason it's the modders that have been pushing the boundaries like this – and Bioware's Mass Effect is an example. Mass Effect could be *beautiful*, instead of just average, with higher-resolution textures but Bioware has no incentive to build them.

Which is a tad sad, because higher resolution textures mean more detail, a more absorbing experience, and a more enjoyable game overall.

And so let me introduce you to the chicken and egg – developers create for cards with 512M or less because that's what everyone has, and to sell their game they need to

pants-spankingly fast GPUs breaking new limits of raw processing power, games are only going to look as good as the textures they are painted with – and this is still hobbled by cards for which 512M is the all but the limit. It's just not enough.

It's good to see NVIDIA's GTX 280 come with 1GB per core standard, and hopefully all its future cards will make 1GB the new de-facto. If AMD does the same, we can wave goodbye to 512MB and start an era with 1GB as the base, and that extra room will give developers a whole new palette to play with when it comes to making our games that much more enjoyable.

Which is, afterall, why we play them in the first place. (P)

There's a reason it's the modders that have been pushing the boundaries like this – and Bioware's Mass Effect is an example.

this to the limit. One solution has been to stream textures on the fly (hopefully without causing stuttering), using technology like id's MegaTexture, or selectively use low-res textures with high-res ones to keep below a card's limit – because while you *can* use more texture memory than you have available on a card, the traffic over the PCI-E bus, no matter how fast, just can't match local memory and framerates plummet.

Which is precisely what you'll get if you install the spiffy new 2GB Rygel texture mod for Crysis that was released recently – a *significant* improvement on the default Crysis textures, but a framerate killer for anything less than a 1G card.

And it's not just about recent games – Oblivion, with a selection of high-resolution texture packs, will push close to a GB of VRAM in-game and stutter on less well-endowed cards; while Half Life 2 with the whopping 8GB Cinematic Mod makes extensive use of high resolution textures and suggests at least 512M VRAM and 4GB system memory!

support the current hardware base. They might have the ability to create more detailed textures, even as an optional add-on, for those with larger than 512M cards (even just for the 640M and 768M cards of yesteryear) but then why would they? It doesn't make monetary sense spending development time for what amounts to no return.

If Valve's Hardware Survey is anything to go by, which at the time of writing consisted of nearly 1.8 million submissions, a mere 8.7 per cent have cards with 768M or more of VRAM.

At the same time, with no games supporting higher resolution textures there's little incentive to produce and sell 1GB cards. And while NVIDIA's latest GTX 260 and GTX 280 have 896MB and 1GB between them respectively, AMD's blazing fast 4-series still sports no more than 512MB per core (per core is the important thing here – dual-GPU single-card solutions with 1GB are still only 512MB per core).

All this is a pity, because it means despite the mind-blowingly awesome game engines coming down the pipeline, and despite the

To fully enjoy Ashton you need at least 2GB of VRAM installed. He's that pretty...

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SCORPION TECHNOLOGY COMPUTERS



Think your computer is a beast? Think again, as **Jake Carroll** takes us on a journey into the mysteries of serious corporate computing power.

As an Atomican, you generally push your rig hard. You clock it up, you tighten the timings and you cool the bejebus out of it. You stand back and watch your buddies drool at the quad GPU meltdown. The data centres of the world are playing a very different game however. 'Big Iron' is a term of respect for extremely large, powerful computing infrastructure.

Leave your desktop at the door.

The technology found in a typical high performance computing (HPC) environment is alien to desktop computing. We'll break it down into a few sections for easy digestion:

- * CPU engineering
- * Networking
- * Storage
- * Graphics/GPU/SPU
- * Cooling
- * Hardware management techniques
- * Software (OS/architecture)
- * Filesystems

Read on to find out all about the ultimate in big boys' toys!

IRON

SECRETS

CPU engineering

Underpinning it all, the not so humble CPU does a big job. Unfortunately, in many situations, our standard cores aren't up to the task. Not enough cores, not enough cache and not nearly enough throughput capability make standard CPUs lacklustre in the high performance environment. So we look to alternative architectures, such as SPARC, IA-64, and IBM Power6. We'll not mention Cell here, as it is a base derivative of the Power architecture.

SPARC

Whenever you log into your bank account or download pictures of your Guitar Hero-obsessed JB-Hi Fi employee mates, you'll likely be hitting a Sun backend. On recent Scalable Processor Architecture (SPARC) systems, such as the T1000, T2000 or Rock hardware, you'll not just find four CPU sockets, but on each CPU, 16 hardware threads of execution. In a four-socket system, you've got 64 hardware threads to

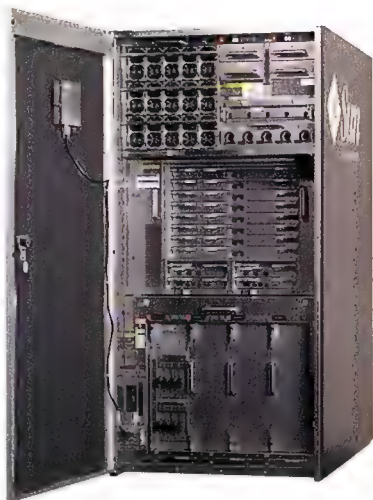


Figure 1: Sun M9000 Series Enterprise computing structure.

scorch the client load with. Of course, with all these threads to play with, you need a system bus many, many times greater than what is traditionally offered in the x86 world. The Sun M9000 series SPARC-based enterprise system has a maximum attainable backplane throughput speed of around 368GB/sec or 1.032 TeraFLOPS (floating point operations per second). No. You're PCI-E 2.0 bus can't do this. It is a mere toy.

Figure 2 shows Sun's CPU technology in action. Many CPU cores associated with transactional cache and quad connected memory controllers, all communicating through a crossbar interconnect. This crossbar is the secret of Sun's ability to do dynamic reconfiguration of resources. Because of this crossbar, the enterprise backplanes are capable of something a little quirky. One can dynamically add pools of CPUs, cores and

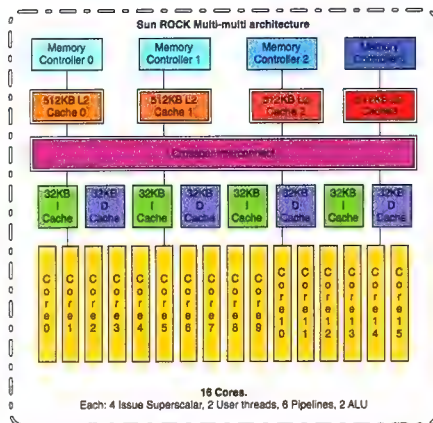


Figure 2: The Sun SPARC 'Rock' Architecture.

system resources to different hardware domains (often called LDOMs, or logical domains).

An example of LDOM resource groups is where large financial database systems find themselves in a situation where user load becomes too large for the current logical domain to contend with. No problems. Simply tell the domain you'll add another CPU to the processor pool. Equally, if DIMM's (dual in-line memory modules) fail mid-flight, it is of little consequence. You can turn off individual banks or slots on a per-DIMM basis – and swap it out hot.

IA-64

Intel's IA-64 architecture started life as an initiative to create high performance 64-bit computing. IA-64 (Itanium) was not a 32-bit CPU with 64-bit extensions, but a total reinvention of bus, register location and cache methodology (L1, L2, and L3 being on die up to 16MB per cache level). Intel aimed this CPU at HPC, along the lines of the SGI Altix series.

The downside was that the IA-64 architecture was hard to compile for, and the platform failed in terms of sales figures. Several years later, Intel created the Itanium 2. The new IA-64 supported higher FSB, better 32-bit legacy support and

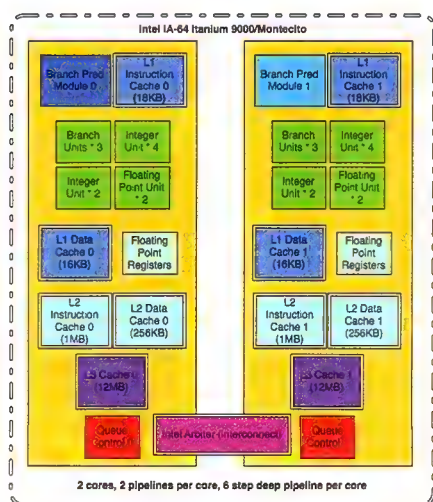


Figure 3: Intel IA-64 Itanium 9000 Architecture.

far more flexible socket connections. Intel broke the high-end server market at this point, and the IA-64 became a commonplace processor in the mission critical server market.

The 9000 series 90nm Montecito provides an eight-stage pipeline, running at 1.66 GHz. This consists of six integer units, six multimedia units, two load and two store units, three branch units, two extended-precision floating-point units and one additional single-precision floating-point unit per core. The hardware employs dynamic prefetch, branch prediction, a register scoreboard, and non-blocking caches. Three levels of on-die cache (count all that cache in Figure 2!) minimises overall memory latency.

The astute reader may have noticed the one thing the Itanium 9000 shares in common with our current Core2 architecture CPUs – a register scoreboard. You may have also noticed, if you've looked deeper into it, that the 9000 series CPU employs software pipeline technology. Think of it like HyperThreading with less cache misses.

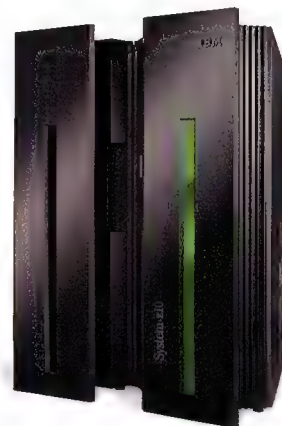


Figure 4: The SGI Altix 4700, Itanium 9100 loaded in production at NASA.

Power6

The IBM Power6 architecture is a competitor to Sun's UltraSPARC IV+/IX series of CPUs. The Power6 is the fastest in-production-stock processor, clocking from factory at 4.7GHz on a 65nm fabrication. Each core has multiple integer units; two floating-point units and all cores in dual core packages are capable of SMT. Where Power6 becomes entirely unique is the treatment of arithmetic units.

Rather than having floating point units



IBM's System z10 utilising Power6 Architecture.

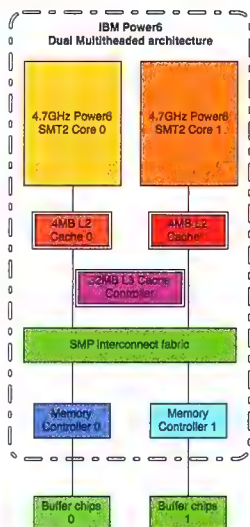


Figure 5: IBM Power6 Architecture.

architectures. IBM has the edge on raw floating-point flexibility. From Figure 5, we can see additional memory logic in the form of a 32MB cache controller.

No matter how the enterprise CPU vendors construe it with their changing arithmetic units, different cache technologies and their varying threading models, the world is moving away from plain symmetric multiprocessing and is moving towards chip multithreading (CMT), allowing single CPU fabrications to utilise many hardware threads per physical unit, going a step beyond the taxonomy of simply adding more cores for more power. Not only do we add cores, we add multiples of threads every time we add a core.

hanging off the side of cache and the central processing logic, the Power6 uses dedicated decimal logic units. The architecture shines in extreme floating point operationally intensive tasks. This is a result of the 50 additional floating-point instructions not present in x86-, IA-64- or SPARC-based

Networking technology

Currently, the key differentiators from your GigE NIC in the back of your motherboard and the kit you'd find in a rack in a cold room somewhere are very few. Technologies such as TCP/IP Offloading Engines (TOE), stack compression and hardware decompression are nothing new. Where the enterprise market edges forward however, is in the 10GigE and Infiniband market for both high performance SAN technologies and HPC/Compute dense applications. One such example of the use of an Infiniband/10GigE Fabric put to good use is TACC Ranger, currently the most powerful supercomputing centre in the world.

The Constellation data centre switch in this building (Figure 8) was designed with 2,048 Infiniband ports to accommodate a total of 49,152 Gbit/sec throughput. To see the Constellation switch in action take a look at the Ranger tour videos.

www.youtube.com/watch?v=gmGlrpsauM
www.youtube.com/watch?v=izhh9_FJmDY

Both Infiniband and 10GigE FC links are still at a price point where only enterprise computing budgets can afford such throughput. These technologies are hard to put close to the home user's budget because of semiconductor fabrication costs and operating system incompatibilities/scalability issues. When we consider that the average 10GigE optical link over long wave small form-factor pluggable transceivers (SFP) is capable of ~1000MB/sec and that generally, these connections will connect to a SAN environment or 4Gig/sec



Figure 7: TACC Ranger, the most powerful supercomputer in the world.

atomic

HOT PC!

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Figure 8: The Sun Constellation infiniband switch.



Figure 9: Finisar shortwave 4Gbit/sec SFP, turning light into 0s and 1s.

switching HBA (~400MB/sec), you've still got throughput that consumer level hard disk and storage appliances are not capable of performing at.

Storage technology

The consumer-grade market has edged closer to SAS for a little while now but still lacks Fibre Channel Arbitrated Loop (FC-AL), which is common in the enterprise chassis sector. Most high-end SAN environments use FC-AL as the primary means of Tier1 storage, migrating down to SAS or SATA, or Tape. FC-AL offers redundancy in spades. With the advent of 6Gbit/sec SAS, FC-AL may have a Tier1 competitor however.

A quick example of enterprise disk redundancy... You have a 15k RPM FC-AL disk array and a SATA array. A fibre path goes dark (a loss of connectivity on the fibre link). You have lost communications to your SATA disk pack. The same thing happens to the FC-AL tray. It doesn't matter however, as the FC-AL interface is multi-pathed (sometimes referred to as MPxIO). You can destroy:

- A fibre communication path to your disk.
- A chassis controller.
- A physical disk module onboard controller (yes, the green PCB connections on the disk!).

...and you still maintain availability.

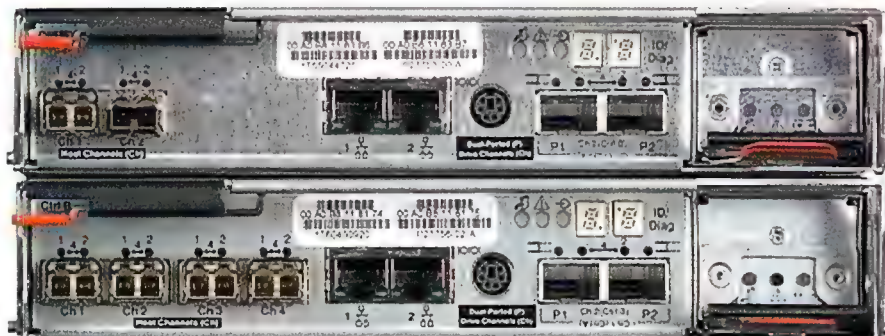


Figure 10: FC-AL backplane from StorageTek 6140 disk chassis showing quad LC-LC 4Gig/sec ports, dual SFP and dual 1GigE copper Ethernet UTP management ports.

Name	Status	State	Disk Type	RAID Level	Used Percent	Total Capacity	Configured Capacity	Maximum Volume Size
1	Optimal	Ready	SATA	5	74%	2.726 TB	2.021 TB	721.569 GB
2	Optimal	Ready	SATA	5	81%	3.190 TB	1.953 TB	1.227 TB
3	Optimal	Ready	SATA	5	78%	2.726 TB	2.065 TB	655.572 GB
4	Optimal	Ready	SATA	5	87%	2.271 TB	1.987 TB	290.596 GB
5	Optimal	Ready	SATA	5	40%	4.772 TB	1.953 TB	2.819 TB
6	Optimal	Ready	SATA	5	40%	4.772 TB	1.953 TB	2.819 TB
7	Optimal	Ready	SATA	1	100%	4.772 TB	4.772 TB	0.000 MB

Figure 11: Common Array Manager virtual disk configuration

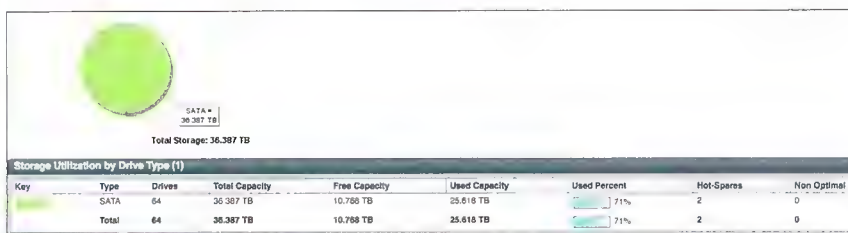


Figure 12: Disk allocation/volume configuration tools.

With such complicated disk controller technology, very comprehensive configuration mechanisms are required to appropriately administer such environments. Array management software, such as Dell's PowerManage or Sun's Common Array Manager (Figure 11, 12) are used to configure Logical Unit Numbers (LUNs), World Wide Names (WWNs) and domain partitioning of virtual disks.

Virtual disk volumes from enterprise disk controllers are presented to HBAs via WWNs associated with the controller part number and disk type.

Graphics and visualisation technology

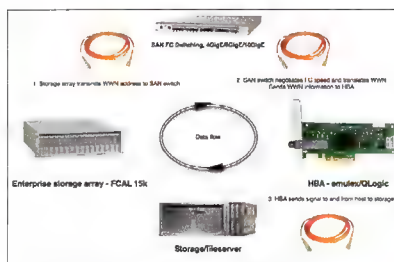


Figure 13: How FC-AL loops interact with enterprise disk connections and hosts.

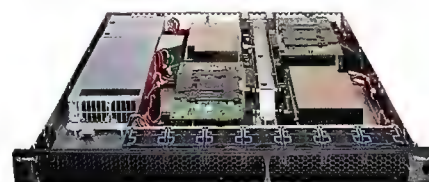


Figure 14: NVIDIA's Tesla 1RU SPU Powerhouse.

That NVIDIA 9-series GPU on your desk might play in the sticks, but the truth is, behind the machine, there is an enormous market in workstation class GPUs and high-end visualisation products. NVIDIA's Quadro/Tesla and AMD's FireStream are serious solutions that are designed for high end rendering tasks. These GPUs and SPUs (Stream Processor Units) are designed for increasing the throughput of computational pipelines. An example might be scan-line rendering output from Maya or 3DS Max 2009, or a long running weather simulation requiring a lot of small but cohesive tasks to be correlated in a singular cycle. Many people are aware of GPGPU (General Purpose GPU)

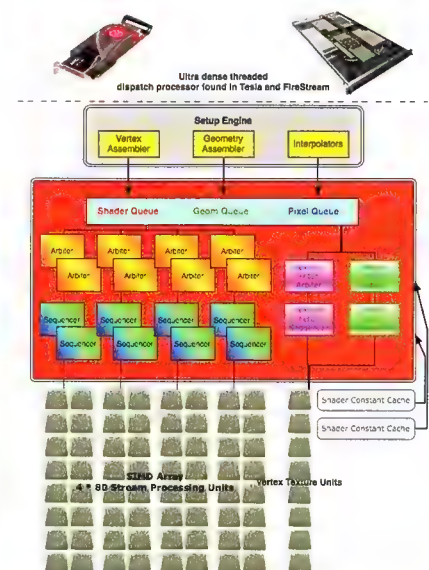


Figure 15: Stream Processor engine.



Figure 16: Cooling with hot isle extraction technology used at TACC. Note the large turbine-like black structures between racks designed to take hot air and push it into a confined location.

and GPU as CPU style applications, but with the advent of NVIDIA's CUDA programmatic interfaces (APIs) and Tesla, high end, ultra high throughput computing from GPUs just became a rackable, data-centre ready entity.

Tesla harnesses the power of many GPUs in 1RU form factors in order to provide computing throughput unmatched by current generation CPU/RAM BUS configurations. GPU processing itself is made so much more efficient for certain types of computation because of the nature of instruction streaming and bus design. SPUs onboard all of today's modern GPUs from AMD (in the form of the FireStream 9250) and NVIDIA are highly efficient long in-hardware fetch, decode and execute cycle engines. These devices can have their pipelines 'stuffed' with data to be processed extremely quickly in a serialised fashion. Pair 512, 1,024 or 2,048 of these pipelines together at any one time and you have a computational device many times more powerful than any current CPU fabrication.

Managing the iron

For any enterprise administrator, the bane of their existence is actually being an enterprise administrator. Looking after all that expensive stuff. How do you have your eyes everywhere at once, with the ability to control hundreds, if not thousands of separate devices all at the flick of a wrist... and still remain sane? Fortunately, all the companies behind enterprise equipment have thought of this for us.

Console/remote access controllers

Sometimes called DRAC, RAC, iLOM, aLOM.

lights-out-management or OpenView, this is the life-line of the typical server. Remote access control allows you to effectively recover a host from certain death, provided there is power and a network connection to it. If you've ever been away from home, trying with desperation to SSH or RDP back to your UNIX or Windows server, only to find that the cat has somehow managed to fatally lock the host up, remote console access is your saviour. Not only can remote access controllers help you reboot, shut down and halt systems, they can also provide time sensitive environmental and component statistics. Sun, Dell and HP support IPMI (Intelligent Platform Management Interface) hardware probes, allowing the administrator to see at a glance (without any dependency upon BIOS, EFI or monitoring software) the status of temperature on all board components, disk enclosure health, interface health, intrusion detection, system up time, voltage on all board components, predictive failure on components, fan controller speeds and fluctuations, and so on. Figure 17 shows iLOM at work on a SunFire x4200M2 quad AMD system.

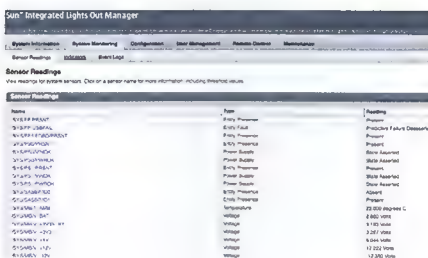


Figure 17: Sunfire iLOM control.



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Perhaps the most complex function within remote access control systems is the ability to upgrade component firmware without the host OS being active, and without active interfaces/disk drives/floppy disks or USB devices. All one needs is the console connection to the host and some power.

Operating system technology in the enterprise

Depending on your persuasion (or religion to some), you can find Operating System technology just as exciting as hardware technology. Enterprise-class operating systems are an entirely different ballgame from the things you see on your desktop. Scalability, transaction efficiency and load handling, as well as availability are all of primary concern – not so much the desktop experience, as it is painted through something like Ubuntu, Mac OS X or

Windows Vista. We've attempted to break the differences down in a few ways.

Processor scaling

Processor scaling of Operating Systems is an oft-misunderstood entity. Fact – Windows XP Pro, Home, Vista Home, Ultimate etc are all 'consumer'-grade operating systems. Fact – they all support multi-core in some way. Fallacy – they all support multi-socket systems. One of the key differentiators between an enterprise class OS and a consumer grade OS is the supported configuration of sockets and cores. Windows 2008 Server might support 16 cores spread across four sockets. But Solaris 10 supports 1,024 CPUs in one homologous system and many thousands in grid/array configurations. The same can be said for HP-UX, AIX et al.

Intelligent memory management techniques

NUMA or Non-Uniform Memory Access is one of the tricky ways to achieve close-to-processor memory latency in high performance environments. AMD's memory-controller-on-chip effectively gave home users NUMA on a small scale. Intel, not content with the performance crown, is also due to move memory controller technology back on-chip shortly. NUMA becomes critical with large data-sets or high throughput. Typically, in the computational and scientific space, NUMA is a requisite function. Imagine swapping or paging 12TB of weather or seismic data in and out of RAM from a physical disk that is many steps away from the CPU it needs to target. If the CPU can non-uniformly access any part of RAM that it requires to complete an operation, without running through linear paths, this makes the whole process much more simple. Especially high scaling NUMA architecture examples are found in the SGI Altix line of supercomputing nodes, as well as any Sun AMD x64 or SPARC servers.

Even more intelligent cache

So, RAM is one thing, but super fast cache is another. Intel came up with a clever method of identifying repeat instructions or 'cache hit' instructions with the Core2 architecture, whereby a simple incremental counter (register scoreboard) checks to see how many duplicate instructions are accessing an identical hexadecimal offset in cache. By doing this, the instruction could be identified and fed more efficiently to the FDE (Fetch, Decode, Execute) pipeline. The most advanced operating systems have gone a step further with a technique known as cache colouring. Currently only supported by Sun's Solaris and FreeBSD (and an abstraction of the Mac OS X xnu kernel), this technology not only allows the hardware to make decisions about cache access efficiency, but the OS to make decisions about cache partitioning as per what is 'hot' and what is 'cold' in terms of always accessed data.

Onboard virtualisation

The big enterprise operating systems such as AIX, HP-UX and Solaris all have their own virtualisation technology built in. Zones, domains and jails (gaol for those of us who care about language preservation!) are all means of hardware abstraction through near-OS resource control tools. This is distinct from standalone snap in hypervisors such as VMware's ESX Server and Microsoft's Hyper-V. With the use of these near-line virtualisation and logical resource control tools, using nothing but low level operating system commands, an administrator can present an instance of an operating system to the public that looks, behaves and performs like the base host OS, but with a few important differences able to be imposed by the administrator:

- * Per CPU resource limits.
- * Per bank memory limits.
- * Network card and interface bandwidth limits.
- * Max user load/client concurrency limits.





I/O Options

iSCSI support in operating systems such as Windows Vista aside, I/O options in enterprise operating systems are in a world of their own. Operating systems such as RHEL5 (Redhat Enterprise Linux), Solaris, HP-UX and AIX all support 10GigE copper, FC/LC NIC, Infiniband and Host Bus Adapters (HBA). All these devices, because of the nature of the interface, associate with WWNs. Think of these like the MAC address of your network card, but longer and more complex. More complex still are the addressing methods used by Infiniband, with a maximum bus bandwidth on a 12x QDR interface of 96Gbit/sec. This is crucial for data-centre interconnects, large disk array connections and other high throughput device connectivity. Within this, link aggregation

and more high-end installations relying upon ZFS technology to keep data safe. With real-time compression, instantaneous snapshots, zero RAID write hole failure, Copy on Write (CoW) and on-the-fly file deduplication on the way, it is a filesystem made for the gods, by the gods. Best of all? It loves cheap disks and expensive disks alike because of the nature of R/W caching in kernel when using ZFS in combination with Solaris 10 or Mac OS X 10.5.

VxFS

The Veritas-owned filesystems, defacto standard for banks or HR divisions running Oracle databases or large personnel management services with high transaction loads, have traditionally exhibited many of the capabilities of ZFS, albeit lacking compression and de-dupe

between the storage types. You might have tier-1 as FC-AL, tier-2 as SATA and tier-3 as LTO4 tape or Blu-ray BD-RE. The end user is oblivious to where the data is and is never aware of where it is stored, nor how it gets there. This HSM technology is becoming more and more popular in enterprises where extreme data density is required (>100TB at any one time) but space/cooling/power are at a premium.

EXT3 and XFS

Linux has defacto roots in EXT- and XFS-based filesystems. Flexible, fast and easily managed with Superblock/fsck facilities, if you find a web-server out there running RHEL + Apache, there is a pretty good chance it will have an EXT or XFS based filesystem.

Lustre

Originally an OSS project for high-performance computing clusters, but quickly swallowed up by Sun (are you seeing a pattern here?), Lustre is a shared-disk filesystem. The power of Lustre is within its node scalability (tens of thousands of storage nodes in any one Lustre-FS). At the core of Lustre is three main parts:

- A metadata target
- Object storage servers
- Clients

Lustre is currently breaking records in aggregated write performance across nodes, so much so that Sun is considering implementing a ZFS backing store for the filesystem for inclusion into a later version of the Solaris 10 kernel.

We hope you have enjoyed our trip around the data centre this month. Overclocking and tweaks are one thing, but, and we think you'll agree, giant cache, huge storage and networking at speeds greater than hard disks can write is oh, so very much more Atomic. ☺

“With real-time compression, instantaneous snapshots, zero RAID write hole failure and so on, it is a filesystem made for the gods, by the gods.”

is also possible (dladm in Solaris 10 for example). If you have five 10GigE NICs in a machine, you can't just 'bridge' them a-la Windows Vista, but you can bond them for link load balancing, redundant failover and IPMP (IP Multi Pathing) for never-say-die networking.

Filesystems

The big movers and shakers are firmly planted in ZFS, VxFS, SAM-FS, EXT3 (XFS within this), UFS and LUSTRE. NTFS was left in the bottom of the esky to drown like so much warm Gatorade.

ZFS

Sun's dynamic, self-healing, Zetabyte scaling filesystem is gaining momentum daily, with more

functions. VxFS uses the common concept of spindle, cylinder and sector building blocks to make virtual disks and LUNs out of disk arrays. Like ZFS, it supports many of the snapshot and block-level magic functionality associated with high-end filesystems. It has the bonus of being a concurrent, or clusterable, filesystem.

SAM-FS

Sun's big daddy of all Hierarchical Storage Management (HSM) Filesystems, StorageTek Archive Manager (SAM) is used by companies such as Disney, NASA, Pixar, The Bank of Japan etc. SAM-FS combines the ability to have single filesystems living on multiple storage types (tiers) with the concept of automatic data migration



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HARDWARE

NEWS, REVIEWS AND ROUNDUPS ON THE LATEST HARDWARE

We've slightly rearranged things this month, pushing all the tasty morsels of tech forward and moving the bigger Head2Head further back. This month we look at two different approaches to dual GPU setups, a very different anthropomorphic heatsink, as well as something that gamers should take note of – mind control!

After you've seen all that awesome tech, next up is the giant roundup of P45 mobos, each armed to the teeth with heatsinks and intricate arrays of coloured plastic and transistors. Keep a special eye out for our new benchmark program, and our cool new graphs and tables.

Read on!



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ATI Radeon HD4870X2

The double-teamed graphics card that proves fast things can come in a relatively small package.

Price \$650 Supplier AMD Website www.amd.com

Specifications 750MHz core; 900MHz memory (1800MHz effective); RV770 core X2; 1600 shader units; 2GB GDDR5; 256-bit memory interface; dual slot PCB with active cooling; 6-pin and 8-pin PCIe power connectors

AMD moved its entire product line to a 55nm production process with its 3-series series cards, but their performance was always below what NVIDIA could offer. No longer. Codenamed the RV770 (incidentally the same core that was reviewed in issue 92), this core has an insane 956 Million transistors, which is actually less than the competition with 1400 million.

The small manufacturing process means a very large amount of cores can be produced on a single silicon wafer, which in turn leads to lower costs to manufacture, and therefore less cost for us. It also means that less heat will be produced, and allows higher clock speeds. The choice to include GDDR5 support with this new core is a great idea too, as the memory bandwidth is a significant improvement on the current NVIDIA mainstay of GDDR3.

So what do you do when you have a single fast core that is already the equal for the value performance crown? AMD thought to slap two of them on the one card.

The two RV770 cores are joined together on a single PCB, measuring a massive 28.5cm and weighing just over a kilogram. A PCIe bridge chip lies between these two cores, and emulates the PCIe express bus of the

motherboard, allowing very high bandwidth communication. Each core has exclusive access to 1GB of GDDR5, which is more than enough for extremely large resolutions with large textures.

Another thing that these cores share is the cooler. This is a reference design, and comprises of two 400 gram solid copper heatsinks on each core, cooled by a large 'squirrel cage' fan. The memory is cooled on one side by this heatsink, but also cooled on the rear of the card by a large black plate. While this seems excessive, it's because there is an insane amount of heat to deal with. Idle temperatures were not too bad, with 56 degrees at 52.2dBA. Load temperatures shot through the bloody roof, however, hitting a max

of 83 degrees with the cooler screaming along at 70.6dBA.

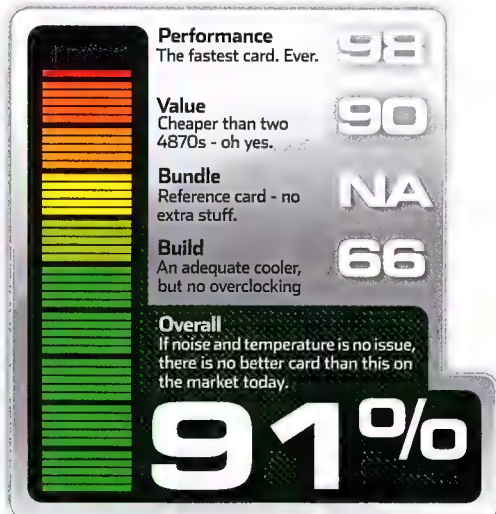
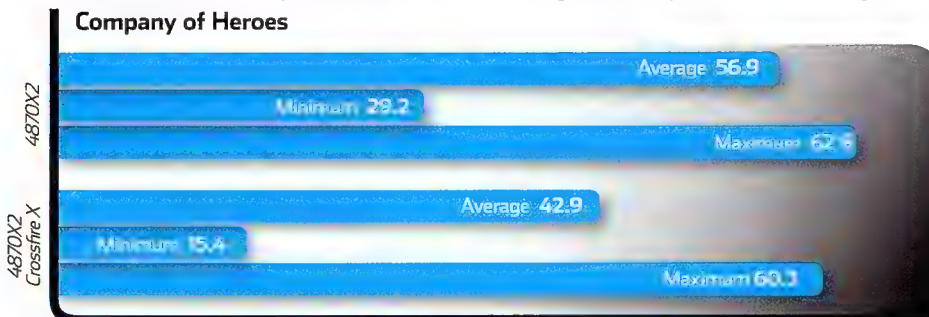
Performance of the two cores is extremely good, pulling in great scores in both 3DMarks and CoH. The 4870X2 was even able to sustain good frames while running at 1920 x 1200 with 8xAA and 16AF, all at stock.

Naturally we couldn't be content with only two graphics cores, so we did the only thing that we could do in this situation – get two more cores. With two cards and four cores in CrossfireX, we actually found that 3DMark06 decreased. This is due to an extreme CPU bottleneck, but is negated by the performance increase noted in Vantage, which is more GPU-based. Good performance with high amounts of AA/AF was also found with this setup.

One of the unfortunate drawbacks of such a hot card is that when you get two of them in close proximity to each other, the issue becomes compounded. Temperatures under load were 84, but idle skyrocketed to 69 degrees. This is the temperature that most cards run at **under load**.

We even crashed the system at stock speeds, using 3DMark Vantage at the highest resolution and AA – hitting a max temp of 91 degrees before giving up and freezing.

This is a blistering fast card. It runs hot, but is perfect for anyone who needs the fastest card possible at a very good price. 



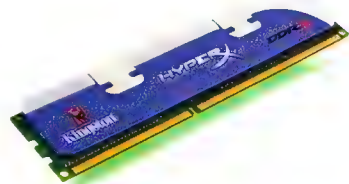


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Website www.protac.com.au

Specifications 750MHz core; 900MHz memory (1800MHz effective); RV770 core X 2; 1600 shader units; 2GB GDDR5; 256-bit memory interface; dual slot PCB with active cooling; 6-pin and 8-pin PCIe power connectors



Similar to last month's review of a BIOSTAR board, we got another one in to see if they can have the same success with an AMD platform. With a very different chipset and CPU socket, there are very many complex and niggling issues that could go wrong when actually designing one of these boards, so let's find out if this has any.

The CPU socket area is very spacious, with a lot of room around three sides – only falling short due to its proximity to the first memory slot, where the heatsink used during testing (Thermalright Ultra 120 Extreme) interfered with the stick physically being placed into the slot. It's a small consolation that the stock mounting bracket is very sturdy, and has screws to hold it together as opposed to the pushpins that many other manufacturers rely upon. This is a great choice, especially if your aftermarket cooler uses this bracket to mount onto the CPU, ensuring that it will remain sturdy even during transport.

The memory slots are spaced quite closely together, but this will only cause an issue with oversized DIMMs (or if you're one of those crazy people who have to watercool four sticks of memory at once). We also point out here the use of a 4-pin CPU power cable, which could possibly be an issue with high overlocks, though we didn't experience any instability during testing. The 24-pin socket is here as well, placed in a very good area for many cases with a hole cut out in the mobo tray specifically for the 24-pin cable, and an IDE port just under this.

Power and reset buttons are in the bottom corner, which make it much easier to bench and even troubleshoot while in or out of a case; even the front panel headers are colour coded and very well labelled – great for connecting

those cables without touching the manual. USB headers as well as a serial and parallel headers are along the bottom, with audio also here. This is good news for cabling, as most cases should reach these headers along the bottom, out of the way of airflow or expansion cards.

The heatsinks that cool the board are made of copper, but are almost pink in colour – suggesting that they might simply be copper plated aluminium.

Irrespective of their materials, these heatsinks do a good job keeping things cool while running, though they did get a little toasty while overclocked; this can be fixed with a little airflow over them.

The back panel of the board has a decent amount of inputs with four USB, one Ethernet, DVI/HDMI (only one of these can be used at a time), VGA, audio and PS/2 ports. No clear CMOS button is present, but you can't really expect one for this kind of price.

You could almost mistake this board for a GIGABYTE, with the light blue dye and colourful plastic everywhere. In fact the only area that it seems to differ is one that is quite important, which is the use (or lack thereof) of solid capacitors. Standard electrolytic caps can be seen everywhere from the power regulation for the expansion slots to the memory. While not necessarily a bad thing, they mean that the power consumption is higher, and they make more heat (which means reduced life).

Overclocking options are well fleshed out, with plenty of control over voltages and features. Most features can be altered and there are no vague options that leave you scratching your head, wondering what they actually do. We managed to squeeze 245MHz out of the board, which is a good result when considering the price.

Another great feature about this board is that the chipset includes a HD3300 graphics core within, allowing multi-monitor support and even some capacity for gaming with just the motherboard. It also includes HD video playback decoding, taking some load off the CPU – making this board perfect for home theatre use. Even if you wanted to run hardcore graphics cards in the board and use three or four monitors, you can do this very easily using Hybrid CrossfireX, making this motherboard and chipset one of the cheapest and most flexible on the market.

With a very tempting price, a multitude of features and the ability to perform in many different roles, this is a motherboard that should definitely get some attention – and it won't break the bank either.

Phenom X4 9950

	WPrime 32M	CineBench R10 64-bit – single thread	CineBench R10 64-bit – multi-thread	Everest Read	Everest Write	Everest Latency
200x10; DDR2-800 5-5-15-24	60.56s	2076	8233 (3.97x)	6756MB/s	5036MB/s	63.9ns
217x10; DDR2-866 5-5-15-24	55.113s	2318	8984 (3.87x)	7303MB/s	5495MB/s	58.8ns
230x10; DDR2-920 5-5-15-24	53.539s	2364	9460 (3.99x)	7661MB/s	5836MB/s	56.3ns

Performance
Solid, but nothing out of the ordinary.

Value
Great price, awesome extras.

Features
Perfect for a home theatre setup.

Build
Electrolytic caps and other corner cutting.

Overall
Great for those on a budget but enthusiasts will want to look elsewhere for their next mobo.

88%

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XFx GTX280

Good things come, clothed in green, pushing pixels to your screen.

Price \$555 **Supplier** XFX **Website** www.xfxforce.com

Specifications 602MHz core; 1100MHz memory (2200MHz effective); GT200 core; 240 stream processors; 1GB GDDR3; 512-bit memory interface; dual slot PCB with active cooling; one 8-pin PCIe, one 6-pin PCIe power connector

This is one card that was sadly left out of last month's roundup – but never fear! Clad in the usual blackened plastic cooler with intricate green artwork adorning the front, this is one card that simply looks fast. The good news? It is.

Running with the GT200 core that we have come to know intimately, and manufactured on

the 65nm process that has been a mainstay for most NVIDIA cards for the past few months, this GTX280 runs at stock frequencies. Unsurprisingly, this also means that the amount of memory remains unchanged, though at a whole gigabyte of GDDR3 running on a 512-bit memory bus, this is definitely more bandwidth than you can shake a stick at, let alone actually need.

The stock cooler is the usual offering, managing load temperatures of 68 degrees at 57.2dBA, and idle temps of 38 and 53.7dBA. This is on par with every other reference GTX280 out there, so there's nothing particularly exceptional about this one. It is more than

sufficient for some overclocking though.

Game performance was very nice, with good scores returned across the board. Even in the newly added 3DMark Vantage the card performs admirably, with the potential for even more if you use PhysX drivers (which weren't used in the testing). With more and more games supporting PhysX, it's definitely something to keep an eye on.

It also seems that these cards still have that strange screaming issue from last issue – we were even able to change the pitch during the Crysis options menu!

With good performance, a copy of *Assassin's Creed* bundled in and a decent price, this is definitely a card to consider. 

XFx GTX280 3d Mark scores



XFx GTX280 Gaming Benchmarks



Performance

ATI may have the edge, but this card still rocks.

92

Features

A solid game completes the bundle.

85

Value

Great performance for the price.

81

Build

The screaming... the screaming...

77

Overall

It might be older GDDR3 RAM that powers this card, but who can argue with 1GB of it.

89%



Inno3D GTX260 Overclock

Further proof that there are untold hidden caches of *Company of Heroes* in the world.

Price \$340 Supplier Inno3D Website www.inno3d.com

Specifications 620MHz core; 1050MHz memory (2100MHz effective); 1339MHz shader clock; GT200 core; 192 stream processors; 896MB GDDR3; 448-bit memory interface; dual slot PCB with active cooling; dual 6-pin PCIe power connector

Every once in a while there comes a game that is so popular, so amazing that everyone wants to get their hands on it. Unfortunately, this is no longer true for *Company of Heroes*, as it has well and truly been played by millions of people, and we definitely don't need another copy of it. Thankfully, *Ghost Recon: Advanced Warfighter 2* is also included in this card's package – it's

quite cool to be getting two very different games with the one card.

The card itself is based on the reference GTX260, with the usual black stock cooler. The front proudly proclaims its overclocked nature, but has an image of the *CoH* soldier on it – something that should have been stopped before it began. Clocks have indeed been bumped up, with an extra 45MHz on the core and 50MHz on the memory. 896MB of memory provides ample space for large textures with AA, and the 448-bit memory interface allows some serious throughput for this aging GDDR3 tech.

Load temps are one degree higher than a stock card, hitting 63 at 56.8dBA, while the idle

temps remain the same at 43 – at 56.5dBA. Performance receives a nice bump due to the overclock, with roughly a 450 3DMark06 points increase.

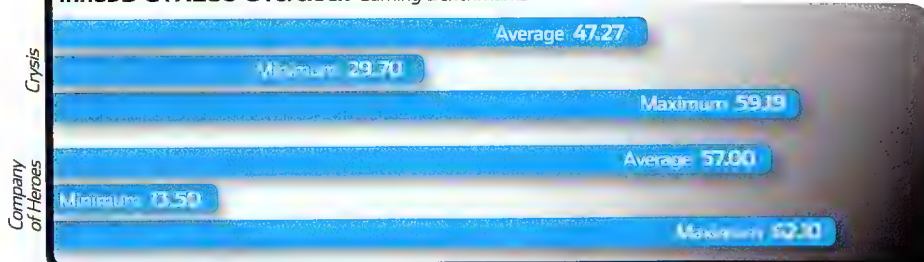
This card is positioned in a very good place in the market too, remaining one of the cheapest GTX260s you can get while offering a factory overclock and two games. Gone are the days, it seems, where you can expect to pay significantly more for this great feature – meaning more performance out of the box, guaranteed.

If you're a diehard NVIDIA fan or simply want a cool running, overclocked card with a great bundle and an extremely good price, then this is definitely the card for you. 

Inno3D GTX260 Overclock 3d Mark Scores



Inno3D GTX260 Overclock Gaming Benchmarks



Performance

Good, but it's no ATI card.

Features

Recent price drops make this a good buy.

Value

Two games? Everyone loves that!

Build

Overclocked and still running cool.

Overall

NVIDIA has certainly come off poorly in the recent stoush with ATI, but this card might still appeal.

84%



SAPPHIRE HD4850 Toxic

Toxic sludge makes graphics cards faster, or so **Justin Robinson** thinks.

Price \$TBA **Supplier** SAPPHIRE

Website www.sapphiretech.com/at/

Specifications 675MHz core; 1100MHz memory (2200MHz effective); RV770 PRO core; 800 shader units; 512MB GDDR3; 256-bit memory interface; dual slot PCB with active cooling; 6-pin PCIe power connector

Following on from last month's roundup of graphics cards, we received a special card that we just couldn't fit in. Don't worry though – we're on the job.

SAPPHIRE present us with its take on the 4850, which is based on the RV770 PRO core with 512MB of GDDR3 memory. The card gets really interesting when you have a look at its

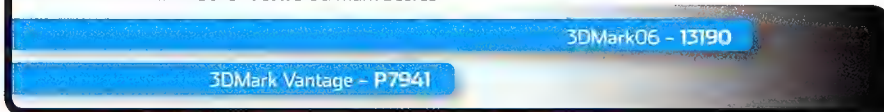
physical appearance – adorned with a Zalman VF900-cu cooler and anodized blue heatsinks, this is a great addition to an already well-endowed card. Not only that, but SAPPHIRE has upped the ante, providing a factory-default overclock of 50MHz on the core and 300MHz on the memory. Even with the overclock, the cooler is able to keep temps down to only 38 degrees at idle and 57 load. Compared to the reference design, this is a massive decrease – almost cut in half, in fact. Unfortunately the downside to this increased performance is an increase in noise, remaining at a constant 63.5dBA irrespective of what the card is doing. This could become slightly annoying while watching movies, but it isn't a deal-breaker.

Performance is also very nice, with *Crysis* running at a smooth average of 42fps, and *Company of Heroes* managing 46.9. While we didn't include them, AA performance did not decrease going from 0x to 4x, which is a great tribute to the hard work that has been put into the card.

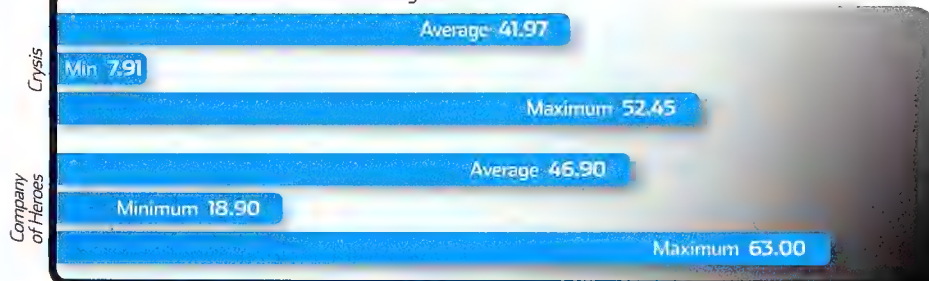
Included in the bundle is a copy of 3DMark Vantage Advanced, as well as all the power cables that you might need. A Crossfire ribbon is also included for some dual-card action.

With a stock overclock, aftermarket heatsink and a benchmark worth \$20 all included in the bundle, the 4850 Toxic is a great choice for anyone looking for DNA-altering performance.

SAPPHIRE HD4850 Toxic 3d Mark Scores



SAPPHIRE HD4850 Toxic Gaming Benchmarks



Performance
Great performance across the board.

88

Features
Great extras - all you need is a game.

86

Value
Price to come, but this is a great bundle.

n/a

Build
A good solid and stable overclock.

87

Overall
It's not a perfect package, but it certainly gets very close to having everything you could want.

88%



Quantum Force

Performance, without compromise

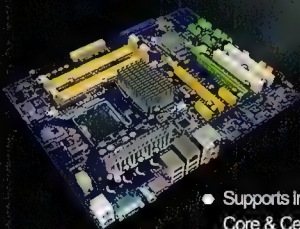
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BLACKOPS



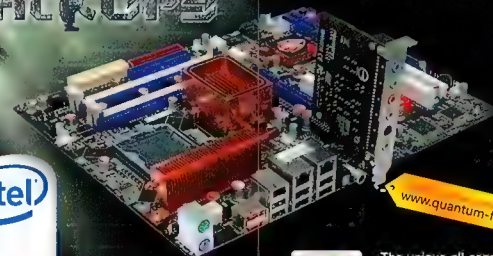
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ECS 9800GTX+ Hydra Pack

Justin Robinson discovers that good things come in incredibly large packages.

Price \$TBC Supplier ECS Website www.ecs.com.tw

Specifications 740MHz core; 1100MHz (2200MHz effective) memory; 1836MHz shader; G92b core; 128 stream processors; 512MB GDDR3; 256-bit memory interface; dual-slot waterblock/active cooler; two six-pin power connectors

Hey you! Enthusiast! Tired of the same old single-card boxes? Fed up with receiving stock coolers and small packaging? Then this is the one product you need.

Similar to the multi-headed Greek water serpent of the same name, the Hydra is a dual-graphics card watercooled bundle (okay, well, not entirely similar –ed). When we first got the box for this behemoth of a pack, we almost thought we'd been sent a monitor due to the immense size of the box itself. This is because of all the included goodies, which include the two 9800GTX+ cards (complete with waterblocks and active fans), a Thermaltake 760i Bigwater watercooling system (coincidentally the same system that we looked at in Issue 90), and all the power connectors that you need to set it up.

Installation is quite straightforward, and is guided by the massive laminated instruction sheet that measures roughly 50cm squared. The instructions take you through installing the gear in an SLI-compatible mobo, while the main unit (a pump, radiator, fan and reservoir) is installed in two 5.25in drive bays.

Once installation was done (and the manual flung carelessly over our shoulder), our benchmarks were fired up and some pixels began to flow. We recorded an idle temp of only 34 degrees, which is very good. Even more astounding, this only jumped by seven degrees under load, reaching a peak of 41 degrees



– perfect for overclockers or gamers who need stability and a cool environment while playing.

This temperature comes at the expense of some noise, with the pump producing 57.5dBA and some vibrations that would almost certainly translate into rattling noise in a case. Each card also has a fan that, albeit slightly pointless, moves air at 54.7dBA, and lights up with blue LEDs. The tubes of the loop became slightly warm under use, but only just above room temperature.

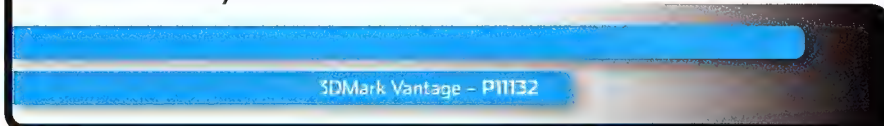
Both of the cards are running the G92b core, a 55nm revision of the 65nm G92 that saw use in the 9800GTX. This smaller process has allowed the core speed to be bumped up to 740MHz, and the shader increased to 1,836. A 256-bit memory interface joins the 512MB of GDDR3 on each card, providing a decent amount of bandwidth, especially with the memory running at a high 2,200MHz. PhysX support is also available on these cards.

Performance of the cards is solid, returning good scores in both 3DMarks, and a decent playing experience in *Crysis* and *Company of Heroes*. These cards will be overclockable past these already high stock settings, and the watercooling will keep the temps down in style.

While most of the system seems quite good, with dual cards and watercooling, there are a few niggling issues. The main unit, while nice and compact, can only fit a single 120mm radiator – this might begin to struggle with overclocked cards during summer. The waterblocks on the cards themselves are full-sized, yet there are many places where they simply don't touch the memory chips at all – a confusing oversight and pointless waste of extra material.

However this isn't a bad product, with watercooled SLI action now more accessible to everyone. (E)

ECS 9800GTX+ Hydra Pack 3d Mark Scores



ECS 9800GTX+ Hydra Pack Gaming Benchmarks



Performance

Just what you'd expect from two stock cards.

82

Value

Hopefully good, but still waiting on price.

N/A

Features

Everything you need and then some!

94

Build

It's not the cooling rig we'd build.

73

Overall

A great way to get into watercooling, but a custom system will always be better.

82%

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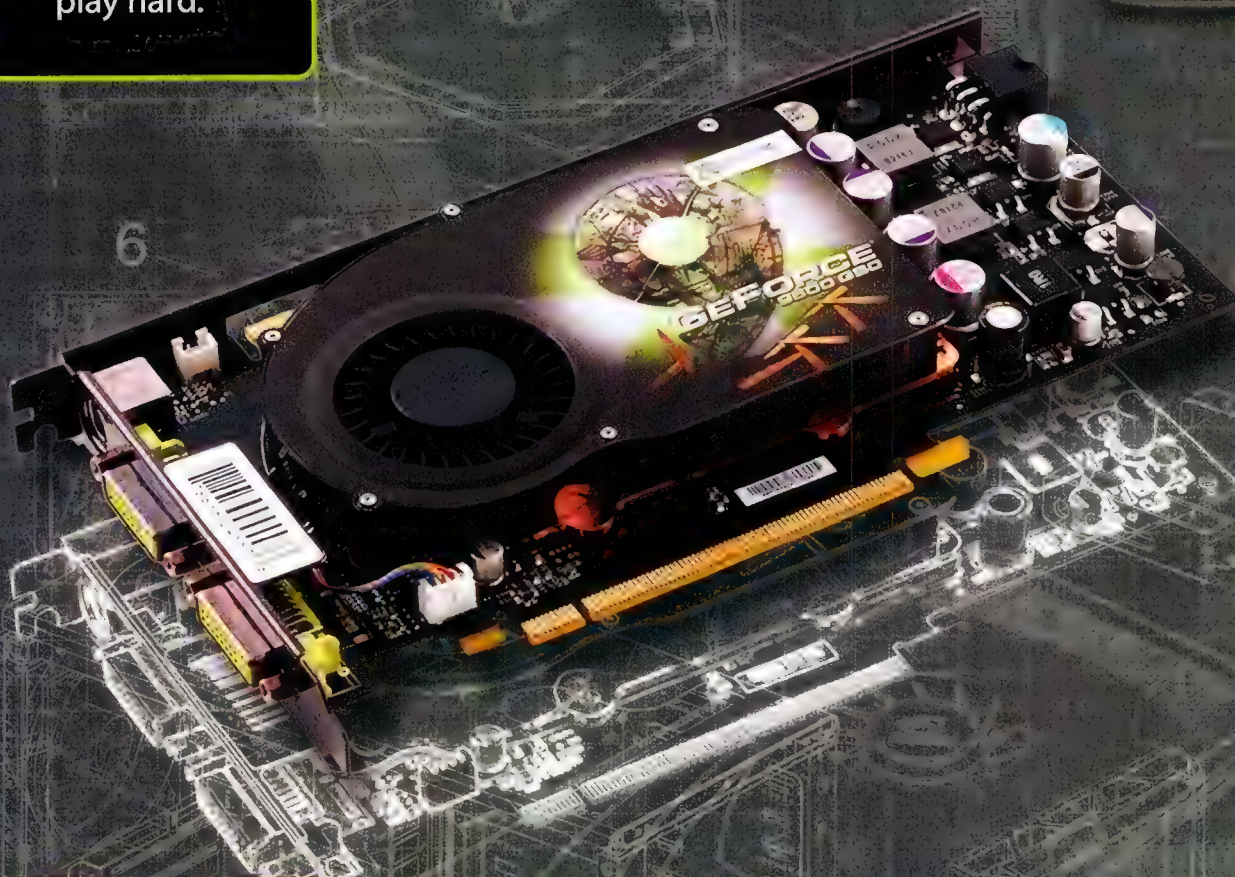
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Leadtek 9500GT

Earplugs definitely not optional.

Price \$100 **Supplier** Leadtek
Website www.leadtek.com

Specifications 575MHz core; 500MHz memory (1000MHz effective); 1400MHz shader; G96 core; 32 stream processors; 512MB GDDR3; 128-bit memory interface; single slot PCB with active cooling

Based on the same core that last month's 9500GT was based on, the Leadtek card is a stock-standard card with a different cooler to the norm.

The core itself is running at 575MHz, while the memory is running at a rather slow 500MHz. With only 32 stream processors, we can't

really expect this card to set new levels of performance, but it should perform decently. Or so you'd think.

Dipped an extremely old-school green colour for the PCB, with a light blue cooler in the center and a relatively large fan, you'd be forgiven for thinking that this card might be a quiet contender for a HTPC. In reality, the fan reminds us of the Delta fans of the nineties, remaining at an extremely loud 72dBA at both load and idle. The temps don't get high at all, thankfully, with 47 load and 35 idle, but this amount of noise is excessive and obtrusive, and we hope it'll be dealt with in future BIOS revisions.

Game performance is lackluster, with both *Crysis* and *CoH* practically unplayable. 3DMark returned results that were reminiscent of the program's release, when it would still crash many machines, with only the QX6850 pulling the 06 score up.

No game is included, and for the asking price this is a very large oversight. Even an aging copy of a game would do much to increase the appeal of the card, or even more useful – a pair of earplugs.

With poor performance, incredible noise and a barebones bundle, we'd stay away from this card unless it becomes significantly cheaper.

Leadtek 9500GT 3d Mark scores

3DMark06 – 6078

3DMark Vantage – P2046

Leadtek 9500GT Gaming Benchmarks



Performance

Cries at the thought of Far Cry 2.

61

Features

Nothing but the card, and only the card.

55

Value

Cheap, but is that useful without speed?

71

Build

WE'RE YELLING OVER THE FAN NOISE!

68

Overall

You can't argue the price is bad, but without anything else to recommend the card, look elsewhere.

63%

GELID Wing 12 Gamer Fan

A fan clad in true Atomic colours, with some tricks under the hood.

Price \$TBC Supplier GELID
Website www.gelidsolutions.com

Specifications 120mm Fan; rubber grommets; fan control box; nanoflux bearing with 100,000 hours MTBF @ 40°C; removable chassis; UV reactive

This fan arrived in a rather conservative box, with all the information you'd need to know, and small windows to show mere glimpses at the fan inside. Once open, there are four rubber grommets (kinda like the rubber nipples on Clooney's batsuit, but actually useful) to reduce vibrations, a small box with a variable speed controller inside, and the fan itself.

The frame of the fan is glossy black, and has the direction of airflow and blade rotation

printed on it, something that is handy for those who can't tell. High quality cable sleeving is on the fan power cable, all the way to the connector, but is not present on the control box.

The Wing 12's fan has nine blades, and each of these has a slightly bent wingtip to create a stronger funnel of air, something that actually works – we could feel air moving up to a few feet away. This can be controlled via the included box, which varies the voltage from 11-5V (the fan can start at 5V too, a great feature for those into quiet computing).

Most of those features are pretty standard, but the Wing has one other feature that no other fan can – the fan blades can be physically removed from the frame! This is done by a small tug on the blades, that lift right off to expose the bearings underneath. In fact, the whole blade system is magnetically levitated, and from a flick of the blades it takes a significant time to stop rotating. The principle is similar to MagLev trains, but much cheaper to manufacture.

Performance was quite good compared to the Noctua fan that we use for testing, with cooling almost as good at high settings, and only two degrees higher at the lowest. It is



slightly noisy at high, but is very quiet at low.

This kind of fan would be great as a part of a themed mod, lit up by UV lights, or just as another case fan. We definitely like this one.

Q6850@3GHz w/ Thermalright Ultra 120 Extreme

	Idle	Load
Wing12@High-59.6dBA	30	47
Wing 12 @ Low-49dBA	32	49
Noctua NF-P12-57dBA	29	47



Patriot Viper DDR3-1800 C8

Price \$TBC Supplier Patriot
Website www.patriotmem.com

Specifications 2x 1GB kit; PC3-14400; DDR3-1800; 8-8-8-20; 1.9v; 240-pin DIMM; Non-ECC Unbuffered DDR3; Micron ICs; Lifetime warranty.

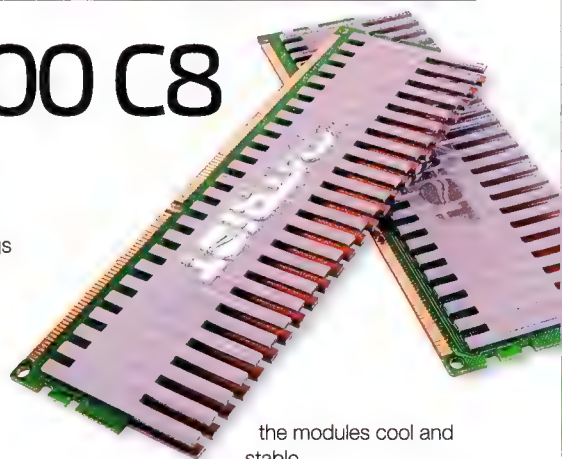
The rather strange name of this memory conjures up thoughts of fast-striking snakes, hell-bent on pumping you with deadly poison. These modules do this, but instead of fast-striking, they're just bloody fast (and pump deadly data instead).

Patriot is an American-based company, specialising in everything from flash drives to extreme DDR kits. It's been around since 1985, so is quite good at its job. While the name alludes to this, the company has also started to move into the Aussie market, so we

grabbed a kit and whacked them into a mobo for some tests.

The modules worked at the stock settings after a short play around with the BIOS settings (as the mobo didn't detect the correct ones, defaulting to 1066MHz instead), and are very fast – with a significant amount of latency hurting the Super Pi result, however. Bringing the speed and latencies down yielded a pleasant surprise in the form of greatly enhanced read and latency speeds, but you'll have to increase the voltage to get it stable.

The Viper sticks are covered on both sides by a 'picket fence' style heatsink, with an embossed brushed steel patriot logo on one side. These are probably shaped more for form than function, but do a good job of keeping



the modules cool and stable.

With warranty good enough for a lifetime (provided you stay within the stock voltage of 1.9V) and great performance, these are some nice modules that will perform very well and look the part too.

Patriot Viper DDR3-1800 C8

	Super Pi 4M	wPrime 32M	Everest Read	Everest Write	Everest Latency
1320x9FSB; 1800MHz; 8-8-8-20(1T); 1.9V	1m 35.675s	56.94s	7553 MB/s	6024 MB/s	75.7 ns
1333x9FSB; 1600MHz; 6-6-6-18(2T); 2.0V	1m 32.5245s	56.269s	9425 MB/s	6084 MB/s	54.4ns



Xigmatek Red Scorpion

Heatsink that aims to prove that red really is better.

Price \$50 **Supplier** Xigmatek
Website www.xigmatek.com

Specifications Tower cooler; three 8mm heatpipes; 12cm fan with rifle bearing; 61.375CFM

Xigmatek is a rather quaint company, with some innovative products and interesting features. When we were sent a heatsink, we assumed that it too would share Xigmatek's penchant for radical design, and we definitely weren't disappointed on that front.

Using three oversized 8mm heatpipes bent into a U shape, this effectively gives six paths for the heat to travel upwards. Once it has been moved, the aluminium fins can dissipate the heat and allow the fan to move it away.

But the base is where the innovation is. Rather than the usual method of connecting the heatpipes to a flat piece of metal that forms the base, the actual heatpipes themselves have been ground down to create a flat surface that connects almost directly to the integrated heatspreader on the CPU. The reasoning behind this is that the heat will be able to go directly into the heatpipes, and effectively cut out the base as a needless extra step. Also included is a spoiler of sorts to direct some airflow downwards toward the mobo to provide some cooling.

The fan mounting is quite strange, using rubber pegs to attach the fan. This caused the fins to be bent slightly, and repeated fan changes might damage the cooler further. The use of Intel stock clips are a convenience, but are a very bad



design choice for those who swap out CPUs very often, as they are quite frail.

Performance is quite nice for the asking price, but the fan has a humming noise and gives off 53.5dBA. While it can't handle the heat of a Quad that has been overclocked, for most Dual cores it will be very nice – and look good too. (C)

Xigmatek Red Scorpion

	Xigmatek Red Scorpion		Thermalright Ultra 120 Extreme	
	Load	Idle	Load	Idle
3GHz, 1.325V	55	34	50	34
3.66GHz, 1.45V	69 - Failed	39	60	39

Overall

Some great design innovations and clever ideas can't help less than stellar enthusiast cooling.

78%

Neural Impulse Actuator

Fancy beating Crysis on brainpower alone? This new toy from OCZ may be just the thing...

Price \$216 **Supplier** PC Case Gear
Website www.pccasegear.com.au

Anyone out there seen the Clint Eastwood cold war thriller, *Firefox*? In it, he steals a next generation Russian fighter plane that can read its pilot's mind, translating thoughts into bullet spitting, missile launching action. OCZ certainly seems to have seen it, as that's the idea about this innovative new gaming controller.

But does that innovation actually translate into a better gaming experience?

We had hoped to have the definitive verdict on that, but there's a

long learning curve, it appears, in getting the NIA actually working as advertised. With that in mind, expect another, fuller review once we either train the NIA to work with Atomican brain waves, or it actually teaches us how to think in new and exciting ways.

What we can say up front is that it is at least a sturdily built little device, consisting of a brushed aluminium control box and a headset with little rubber pads. The term 'neural' is bit of a misnomer, though, as rather than reading actual brainwaves, the NIA picks up muscle and nerve activity on your forehead. These readings are then translated into different 'brainfingers'. And yeah, we feel stupid just typing that word. There's also a function that can map to a function similar to a horizontal controller.

In theory, when it all works, you'll still use a mouse and keyboard, with the NIA augmenting your usual responses, and eventually taking over from the keyboard entirely. It's a great idea, cutting your response time in half for movements such as jumping and strafing, and such.

In practice though, it's a tough task. In some rigorous testing, we found our apparent level of gaming skill had dropped to that of a tired

slug. With the NIA reading your subconscious muscle motion, you suddenly get rather self-conscious of it all. What this leads to is a hilarious (for those watching you) combination of gurning and random leaps and movements in the game that, sadly, lead to a swift virtual end. Our skill has improved a little, but more use is necessary. That said, the NIA's manual is quite upfront that training the device is a long term process.

Which means we'll be looking like some kind of idiot for a few months yet. So far the NIA is promising, and if it can deliver then we're hooked. Who doesn't like the idea of using MINDPOWER alone to zoom a sniper-scope? (C)

Overall

So far we're not seeing a huge improvement, but there's a lot of testing to be done yet.

69%



Sennheiser PC 350 headphones

Big and chunky, but damn fine on the ears.

Price \$239 Supplier Sennheiser
Website www.sennheiser.com.au

High quality sound reproduction is something that is all too easy for the PC enthusiast to overlook on the long and arduous journey toward computing perfection. But what's the point in spending hundreds, maybe even thousands, of dollars on graphics cards when any gaming experience is going to be let down by cheap headphones?

Sennheiser is renowned for producing solid cans of all stripes, and its G4ME range is no exception. The nomenclature may seem a tired attempt to leverage modern computing cred, sure, but the weighty PC350 headphones demand respect the moment you get them out of the packaging. These are hefty headphones, and slims necks out there may quail at the thought of supporting a noggin sporting a pair. It's worth it though.

Before we even listened to a tune or racked the slide on a Colt M4 in Counterstrike, we were impressed by just how much sound the ear pads cut out in our noisy testing environment. The padded ear cushions are

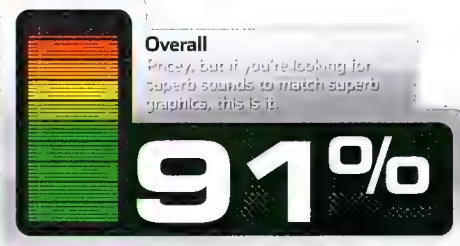
also nice and deep, meaning that you get a good seal as well as a comfortable listening environment. They swivel through ninety degrees of lateral movement, too, so will fit practically any head. The weight is alleviated somewhat by thick padding on the over-head strap, too, so while the PC350s may take some getting used to (especially if you're used to lighter 'phones), they quickly become nice and comfy.

And when that sound first starts to flow, you'll be glad you made the effort. We certainly were.

In listening to a range of music, from quite acoustic works to more strident electronic efforts, we were surprised to a rich layering of sound, clearly reproduced across nearly the entire playback range. If we had to pick a low point, it's that the over-cranked bass can dominate some tracks. Of course, turn off the music and get down to some gaming and they come into their own. Things really rumble in the PC350s, and the real bonus is that even the noisiest of modern gaming systems is as



nothing to these epic cans. The boom mic is a great piece of design, too. Though not as flexible as some, it features noise cancelling tech and outward facing pickup to make sure that your friends only hear your gloating voice, and nothing else. Win.



Razer Mako 2.1 speakers

Great design and top sound, but at a price.
David Hollingworth is wired for sound...

Price \$599 Supplier Audion Innovation
Website www.audion-mm.com

The Mako speakers are marketed as your classic 2.1 desktop PC speakers, but in our testing we found they are more versatile than that. And with a unique and functional design, why hide them away in your study, games-pit or grind-house?

Our gaming lab is, essentially, a large old warehouse, so it can be a chore to get a set of speakers to fill the area. The Makos handled the space with aplomb, surprising all and sundry with rich bass rumble in games, and more than adequate for home entertainment needs. Sure, it's no 5.1 system, and for the same money you could easily get one, but the Makos have one big advantage.

There is more than style behind the unique dome-like design. The Mako speakers boast downward pointing speakers, so that the sound they produce is omni-directional. No matter where you are listening to them in a room, the sound is always top-notch. Only the mid-range

is a little weak, so quieter games or films may not be reproduced to best advantage.

About the only let down to the speakers as a proper set of lounge room models is the wired remote. Of course, this isn't an issue for desktop computing, but even then the dial-less touch sensitive remote can be rather fiddly to quickly adjust in the middle of the game, as more than one finger on the dial tends to scramble the input. It looks good, at least, and the LED sound level is very handy for darkened home theatres or late night gaming.

These speakers are very nearly the perfect solution for those who are limited in the amount of space they can fill with AV equipment, and deliver great sound. But we can't help but feel that, for the price, you can quite easily pick up more complete solutions – albeit ones that



aren't of quite so impressive performance. Ultimately, your hip pocket will have to be the judge.



**Feel the Heart-Shaking Delight
from the Energetic Efficiency and Natural Screen.**



FX720

- Latest Intel® Centrino® 2 Processor Technology
- Genuine Windows Vista® Home Premium
- 15.4" ACV (Amazing Crystal Vision) Display
- nVIDIA GeForce 9600M GT 3D Graphic Card with 512MB VRAM
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- MSI's Exclusive ECO Engine Power Management System
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- Theater Class 4.1 Channel Surround Sound Effect and Subwoofer
- Exclusive MSI VIVID Image Enhancement Technology
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- Featuring the Latest E-SATA Support
- Built-In 2.0 Mega Pixel Webcam
- Theater Class 4.1 Channel Surround Sound Effect and Subwoofer



Stylish Brushed Aluminum Housing



Exclusive Turbo Drive Engine Technology



Exclusive ECO Engine Power Management System



nVIDIA GeForce 9600M GT 3D Graphic Card with 512MB VRAM



Theater Class 4.1 Channel Surround Sound Effect and Subwoofer. Recognized by Dolby® Surround Sound



**Performance
to go**

Coolermaster HAF 932

Not exactly love at first sight, but this case will grow on you.

Price \$199 **Supplier** CoolerMaster
Website www.coolermaster.com

Specifications 230 x 545 x 575mm (W x H x D); 13.2kg; Micro-ATX/ATX/E-ATX; 6x 5.25in drive bays; 6x 3.5in drive bays; USB 2.0 x 4, IEEE1394a x 1, eSATA x 1, Mic x 1, Audio x 1; 1x 230mm fan (front), 1x 230mm fan (side), 1x 230mm fan (top), 1x 140mm fan (rear); steel & plastic construction.

At first blush, we really weren't all that excited by the HAF (or, as we have lovingly dubbed it in the Labs, the HOFF). It's exaggerated industrial style design, and the claim that it's a case designed by gamers for gamers, left us a little cold. But after a few minutes messing about inside the HAF, and sampling some of its not quite so obvious delights, we were sold.

HAF stands for High Air Flow, and with that in mind you might think that a mere four fans falls way behind the air-cooling pack. Well, you'd be wrong, truth be told, as the large 230mm fans in this case push a large volume of air through the HAF's innards. What's more, they do so remarkably quietly – we could barely discern any kind of hum or murmur as they spun up. The 140mm rear fan is a little louder, but not by much. The front fan is also blinged up with the addition of a red LED to light up is clear plastic construction; the other fans are all plain black. In a dark room, the combination of red glow and metal mesh is really quite attractive. It's a good, aggressive gaming look.

The side and top panels are also studded with more mounting points, so you can swap out the 230mm fans and replace each with four 12mm models. If noise isn't a problem,

but you want some serious airflow – perhaps for an air-cooled overclock – it's a great option. The faux-industrial look is further cemented by an embossed X-shape on the left-hand panel, and a small window with metallic cross-hatching on the right. Some after market paintwork – perhaps some industrial striping – would be an ideal addition.

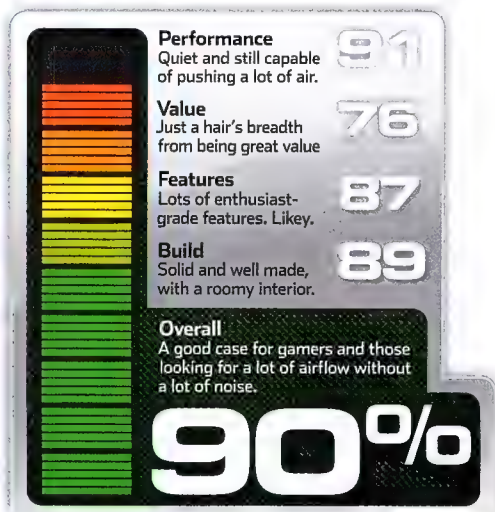
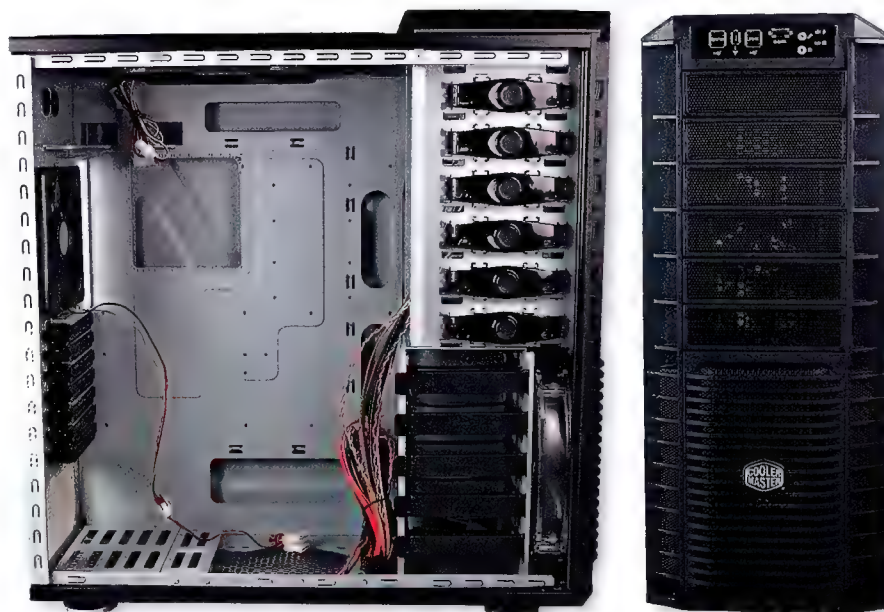
Some quick work with the comfy thumb screws on the case's side panels sees both easily hinge out and off, revealing a rather well-appointed interior. The first thing that strikes you is that the front IO cables are all quite long, and that you can mount a PSU at either the top or bottom of the case. What this means is that you can orient your motherboard however you wish, and combined with the excellent clearance behind the mobo backing-plate, keep all that cordage and more well out of sight.

The HDD bays orient so that they face out of the side, and the sliding and locking brackets combine secure mounting and ease of swapping. Mesh vents cover the front bays, and these are much easier to remove than some earlier CoolerMaster designs. Still, with all that mesh, and the high airflow this case



engenders, it would have been nice to see some kind of filtering included. Otherwise, the build quality is solid, with a mix of smooth metal edges and some limited plastic sheathing to protect cables and fingers alike.

This is a big case, and one that hides a lot of useful features and functionality. Like many strong case designs, it may not be for everyone, but the features – especially the quiet and expandable airflow – alone make this a case that's hard to hate.



Built for the Extremes!

GIGABYTE EP45-EXTREME Series



GA-EP45-EXTREME

Intel® P45 + ICH10R Chipset



- DES Advanced technology featuring hardware based dynamic 6-Gear switching
- Supports 45nm Intel Core 2 multi-core processors with FSB 1600MHz
- Advanced power phase design with virtual 12 power phases
- Dual channel DDR2 1200 for remarkable system performance
- Embedded 2 power phases for NB chipset and 2 phases for memory power
- 2 PCI-E 2.0 x16 plus PCI-Ex4 interface with ATI CrossFireX support
- Blu-ray playback supported by 106dB SNR ALC889A HD audio
- Dolby Home Theater delivers outstanding entertainment audio experience
- Pure copper thermal design with Hybrid Silent-Pipe design
- Power/Reset/Cir CMOS onboard button for easily operation on the workbench



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GA-EP45-DS4P

Intel® P45 + ICH10R Chipset



- DES Advanced technology featuring hardware based dynamic 6-Gear switching
- Supports 45nm Intel Core 2 multi-core processors with FSB 1600MHz
- Dual channel DDR2 1200 for remarkable system performance
- 2 PCI-E 2.0 x16 plus PCI-Ex4 interface with ATI CrossFireX support
- Built-in TPM chip with 2048bits encryption to highest level digital data protection
- 2 Gigabit Ethernet LAN through Teaming function
- Blu-ray playback supported by 106dB SNR ALC889A HD audio
- Dolby Home Theater delivers outstanding audio experience
- Power/Reset/Cir CMOS onboard button for easily operation on the workbench



GIGABYTE™

Treading the 'boards

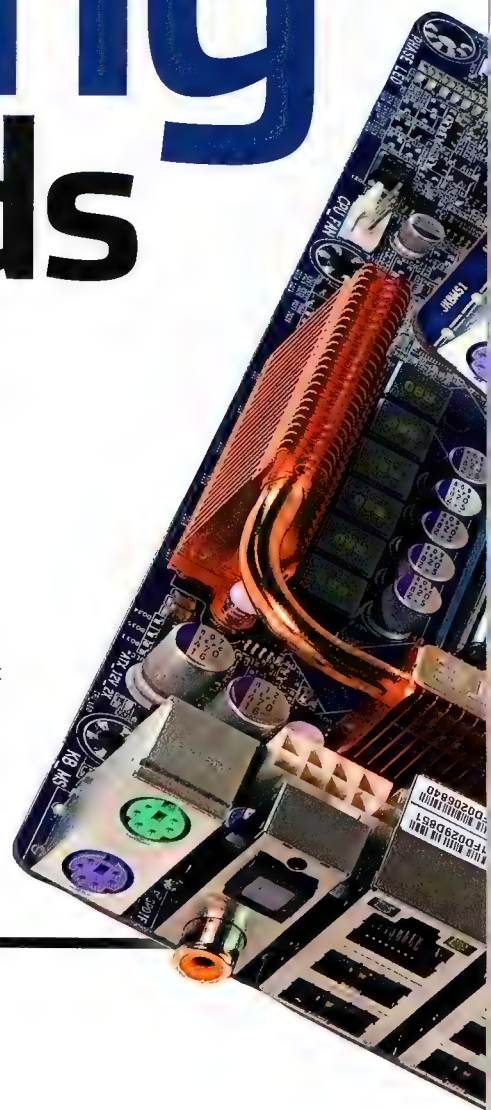
One board to rule them all... Ten competitors.... Eccentric designs. **Justin Robinson** weighs up the pros and cons of your next motherboard.

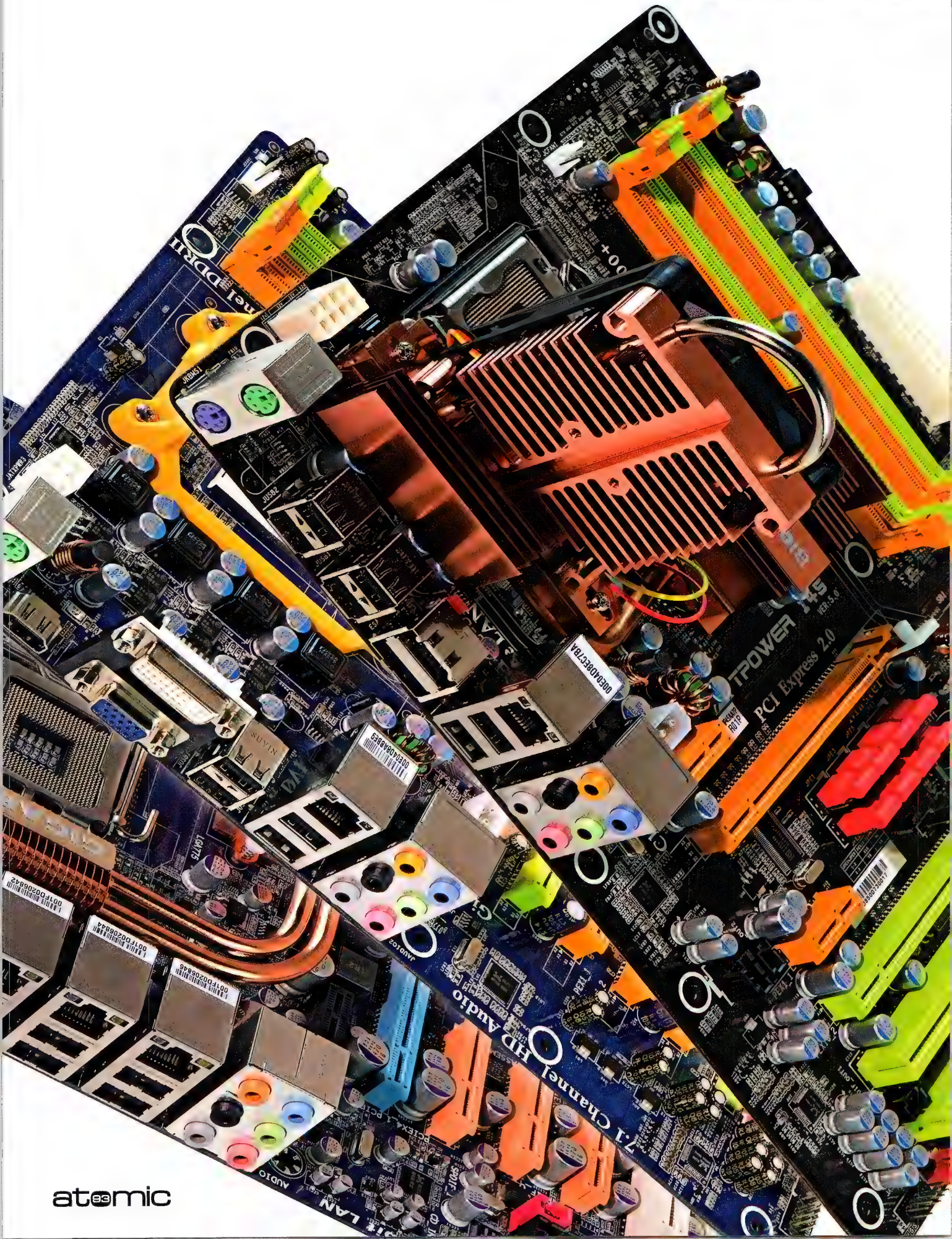
Ever since the original P35 Bearlake chipset came out, enthusiasts have enjoyed a great chipset with a solid feature set. With the successor, the name has changed to 'Eaglelake' – definitely indicative of the speed of the new series.

With the combined effort of Intel's massive blue piggybank, and an R&D team that would make a small country look miniscule, this new chipset seems strangely familiar in both name

and function. More and more manufacturers are jumping on the Intel team, pumping out a torrent of boards, washing away most people's hopes for an easy choice – but that's where we step in.

This month we place ten motherboards in a circle with a sharpened stick, and only one will survive our testing and come out on top. Which board will it be? Is the P45 a worthwhile upgrade from the P35? Well, you're going to have to keep reading to find out.





How We Tested

A motherboard roundup involves very precise measurements of the performance of each board, especially in cases where each mobo is based on the same chipset, offering a similar amount of expansion options. We chose some of our more powerful hardware, and used this in each mobo at stock settings, 3.4GHz and 3.8GHz where possible.

This is what we used with each board:

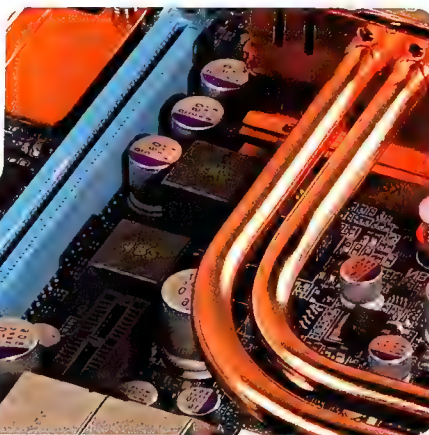
- P45-based motherboard
- Intel E8400 @ 333x 9 = 3000MHz
- TeamXtreem DDR2 @ 1066MHz, Patriot Viper DDR3 @ 1066
- Antec TruePower Quattro 1000W
- WD Velociraptor 300GB
- Thermalright Ultra 120 Extreme

Each system used the same components to ensure that results are easily compared, and

the parts were chosen to reflect a common enthusiast's system. The operating system was Microsoft Windows Vista Home Premium 64-bit SP1, with no audio or network drivers installed.

We used three different programs to benchmark the boards: SuperPI 4M to test the memory bandwidth, wPrime to test the CPU speed and Cinebench R10 to test how well the motherboards can handle scaling with multiple cores present.

As well as theoretical benchmarks at stock speeds, we pushed each board to the same levels (though a few could not make it) and



Want to test your own rig?

There's no better way to get an idea of what our figures mean than by benching your own gear. With that in mind, here's where you can go to find the programs that we use in this Head2Head:

SuperPI

<http://www.brothersoft.com/superpi-66585.html>

wPrime

<http://www.wprime.net/>

Cinebench R10

http://www.maxon.net/pages/download/cinebench_e.html

Happy testing!

recorded how well they were able to handle the speed. The physical layout of the boards was also looked at, and the features of each board are compared in the table over the page. Any irregularities such as heat, inability to overclock and potential limitations with the BIOS' were also noted.

Now that you know how we went about testing, flip the page to get into the meat of our work – the results.

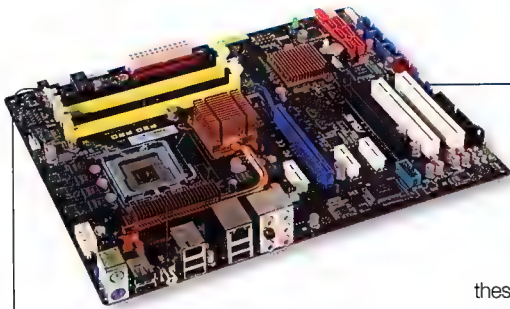
Motherboard Specifications

	ASUS P5Q Deluxe	ASUS P5Q PRO	BIOSTAR Tpower I45	ECSP45T-A	GIGABYTE EP45-DQ6
PCIe X16 slots	1	1	1	1	1
PCIe X8 slots	1	1	1	1	1
PCIe X4 slots	1	0	0	0	2
PCIe X1 slots	2	3	2	2	1
PCI slots	2	2	2	2	2
IDE	1	1	1	1	1
FDD	1	1	1	1	1
SATA	8	8	6	6	10
Memory Type	DDR2-1066	DDR2-1066	DDR2-1066+	DDR2-800	DDR2-1200
4/8-pin power connector	8-pin	8-pin	8-pin	4-pin	8-pin
USB ports	6	6	6		8
Ethernet ports	2	1	1		4
Onboard power/reset buttons	Yes	No	Yes	Yes	Yes
Clear CMOS button	No	No	Yes	No	Yes
Price	\$230	\$168	\$190	\$145	\$335

Motherboard Specifications

	GIGABYTE EP45-DS3R	GIGABYTE EP45-DS4P	GIGABYTE EP45T-Extreme	MSI P45 DIAMOND	MSI P45 PLATINUM
PCIe X16 slots	1	1	1	1	1
PCIe X8 slots	1	1	2	1	1
PCIe X4 slots	0	1	0	0	0
PCIe X1 slots	3	3	0	2	2
PCI slots	2	1	3	2	2
IDE	1	1	1	1	1
FDD	1	1	1	1	1
SATA	6	6	6	8	8
Memory Type	DDR2-1200	DDR2-1200	DDR3-1900	DDR3-1600	DDR2-1066
4/8-pin power connector	8-pin	8-pin	8-pin	8-pin	8-pin
USB ports	8	8	8	8	6
Ethernet ports	2	2	2	2	1
Onboard power/reset buttons	No	Yes	Yes	Yes	Yes
Clear CMOS button	No	Yes	Yes	Yes	Yes
Price	\$170	\$195	\$359	\$370	\$240

Onto the reviews...



ASUS P5Q PRO

A well-thought out mobo from the A-team.

Price \$168 Supplier ASUS Website www.asus.com.au

Specifications Socket 775; Intel P45 chipset; ATX form factor; 1x PCIe x16; 1x PCIe x8; 2x PCI; 3x PCIe x1; 1x EIDE; 1x FDD; 8x SATA; 1600MHz FSB; DDR2-1066

ASUS has a large presence in the PC market, with a veritable flood of products ranging from motherboards to sound cards. Here we have its budget P45 offering.

Using a milk-chocolate coloured PCB, with small darkened heatsinks and components, most colour choices on the board seem to be in keeping with aesthetics rather than for any practical purpose. Even the solid capacitors on the board are a red colour, a good match for the brown PCB. Thankfully

these remain relatively clear of the CPU socket, leaving plenty of room for oversized coolers. The memory slots are also in a great location, with plenty of space around them to install and remove modules without removing the graphics card. Similarly, the main power plugs and the IDE port are all in good places too, allowing for neat cabling when installed.

Down the bottom corner are the SATA ports arranged in a neat row, out of the way of all but the widest graphics card coolers. Also present here is a strange LED with full cover – similar to what you'd buy from an electronics shop. This seemingly

only shows power to the Southbridge, and lights up whenever power is plugged in.

We had a few issues getting our DDR2 to run at 1066, such as refusal to POST and other similarly fun Windows errors. We finally just settled for lower frequencies. The BIOS is relatively easy to navigate, though be prepared to look around for specific options for a small while until you become familiar with it.

Performance was good, and it certainly is far from expensive. We'd definitely put this one on our shortlists, and we think you should too.

ASUS P5Q PRO

	Super PI 4M	wPrime 32M	CineBench R10 64-bit – single thread	CineBench R10 64-bit – multi-thread
333x9; DDR2-800 5-5-5-15	1m 29.361s	53.633s	3689	7167 (1.94x efficiency)
378x9; DDR2-866 5-5-5-15	1m 21.135s	46.472s	4193	8030 (1.92x)
423x9; DDR2-920 5-5-5-15	1m 12.852s	42.261s	4687	9064 (1.93x)



ASUS P5Q DELUXE

A motherboard that isn't afraid to declare its status in all-caps

Price \$230 **Supplier** ASUS **Website** www.asus.com.au

Specifications Socket 775; Intel P45 chipset; ATX form factor; 1x PCIe x16; 1x PCIe x8; 1x PCIe x4 (electrical); 2x PCI; 2x PCIe x1; 1x EIDE; 1x FDD; 8x SATA; 1600MHz FSB; DDR2-1066

ASUS' offering here is their premium, or 'Deluxe' version, of the P45 chipset, complete with many features and niceties that the cheaper boards simply don't have. The most obvious physical difference is that the heatsink array has grown (like a tumour, but less deadly) to cover the Southbridge, as well as all the power regulation at the top of the board.

The back panel has six USB, eSATA and Firewire, two Ethernet, audio and PS/2 ports. Just beneath this area, the expansion slots are rather full-featured, and even include

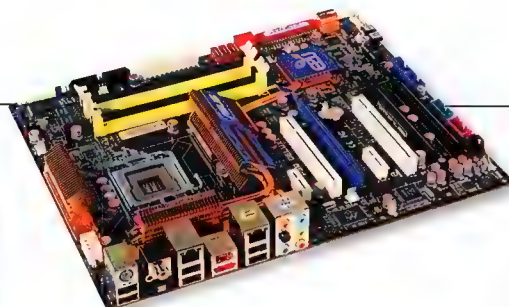
what looks like a flash drive mounted in between the lower PCI slot and the bottom two slots. Well, that is because it is flash memory, ASUS' ExpressGate in fact, containing a Linux distro that allows internet surfing, chat, photos and skype.

Headers lie along the bottom of the board, as well as physical power and reset buttons that light up when the board has power. Sadly there's no reset CMOS button, nor is there an obvious header – requiring the removal of the battery. This is directly under the top PCIe slot, which means that the graphics card will have to be removed if

you want to do this, which is rather annoying. The memory slots are also in an annoying place, with the graphics card in the way of the bottom clips, preventing easy access to the modules.

We had some issues when overclocking this board on the BIOS it came with (0204), but all these issues became immaterial after a simple flash.

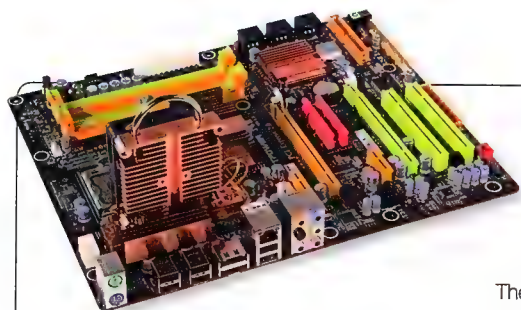
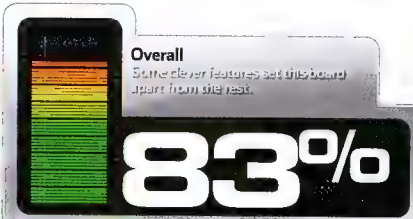
With some good placements, and a Linux distro built into the mobo, this is a board that is definitely worth a good, long look at.



ASUS P5Q DELUXE

* Would not work until BIOS update 0803

	Super Pi 4M	wPrime 32M	CineBench R10 64-bit – single thread	CineBench R10 64-bit – multi-thread
333x9; DDR2-1066 5-5-5-15	1m 25.488s	53.243s	3700	7201 (1.95x efficiency)
378x9; DDR2-1008 5-5-5-15	1m 16.908s	46.359s	4177	8163 (1.95x)
423x9; DDR2-1016* 5-5-5-15	1m 10.496s	41.574s	4623	9076 (1.96x)



Biostar presents its dark-chocolate flavoured version of the P45 board with some pretty interesting design choices. Although you can't tell from the picture, that fan assembly above the power regulation was not installed at stock, and came bundled in its own packaging inside the mobo. A small strip of adhesive goop works to fill the gaps, and the heatsink became slightly warm during testing – showing that it was actually doing something towards cooling the mobo.

The power connectors and RAM slots are placed in the usual spots, with six right-angled SATA ports on the right-hand side of the board – great for installing devices with longer graphics cards. Just above these is a clear CMOS header, which will be blocked by those longer cards that we love so much.

Power and reset buttons are in the bottom corner, and are even backlit for visibility inside a darkened case. Also present here is an LED screen that displays the CPU temperature constantly – great for windowed cases or overclockers.

Biostar TPower I45

Comes with a heatpipe carrying handle for easy installation!

Price \$190 **Supplier** Protac **Website** www.biostar.com.tw

Specifications Socket 775; Intel P45 chipset; ATX form factor; 1x PCIe x16; 1x PCIe x8; 2x PCI; 2x PCIe x1; 1x EIDE; 1x FDD; 6x SATA; 1600MHz FSB; DDR2-1066+

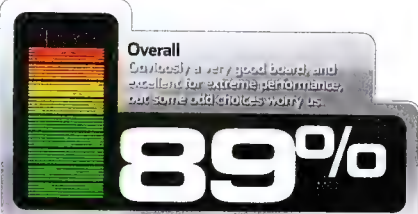
An archaic header-switching system is used instead of the automatic system used on other boards; this can make using Crossfire difficult if you're not used to them.

The BIOS is well laid-out, with plenty of options for tweaking voltages and other settings, as well as a failsafe mechanism to restore default settings if something goes awry – all too common when overclocking.

This board has been used to break many world records, with an FSB reaching well over seven hundred MHz <http://tinyurl.com/5ntua5>.

Biostar TPower I45

	Super Pi 4M	wPrime 32M	CineBench R10 64-bit – single thread	CineBench R10 64-bit – multi-thread
333x9; DDR2-1066 5-5-5-15	1m 24.869s	54.766s	3692	7071 (1.92x efficiency)
378x9; DDR2-945 5-5-5-15	1m 16.513s	48.000s	4154	8153 (1.96x)
423x9; DDR2-1015 5-5-5-15	1m 12.829s	42.906s	4695	9018 (1.92x)





GIGABYTE GA-EP45-DS4P

Interesting features, tempting price, and some other third thing.

Price \$195 Supplier GIGABYTE Website www.giga-byte.com

Specifications Socket 775; Intel P45 chipset; ATX form factor; 1x PCIe x16; 1x PCIe x8; 1x PCI; 3x PCIe x1; 1x PCIe x4; 1x EIDE; 1x FDD; 6x SATA; 1600MHz FSB; DDR2-1200

Crawling out of the packaging like a mutant hybrid of the DS3R and DQ6, the DS4P is a compromise between those two other boards, offering some premium features, and other more standard ones. Dressed with premium chipset cooling, but with the power regulation around the CPU more like the standard, the CPU socket is relatively open, and can fit most large coolers.

Power ports are again in a very good spot, with the FDD and IDE in the same places as the other GIGABYTE boards. Six SATA ports are down below, and none are right angled.

They're also moved out of the way of longer graphics cards in an attempt to maximise the actual usage of them. Included along the bottom are the usual USB headers, Firewire and front panel stuff, as well as onboard buttons for power, clear CMOS and reset, which are extremely handy for those who overclock in or out of a case.

The expansion slots are the same as the DQ6, with nothing amazing to note. Front panel audio is in the worst spot ever – right in the middle of the board again.

Moving to the back of the board, it appears to be a duplicate of features from the DS3R. Spread

liberally around the board is an array ferrite chokes and solid capacitors, rounding up the overall quality feel.

The Optimal default in the BIOS again frustratingly disables USB keyboard support (if any GIGABYTE BIOS engineers are reading, change this!), but the overclocking options are well fleshed out, and very easy to use.

For a small increase in price over the DS3R, you get a board with lots of premium features and better chipset cooling, without the expense of the DQ6. This is definitely a very good choice for any enthusiast.

GIGABYTE GA-EP45-DS3R

	Super PI 4M	wPrime 32M	CineBench R1064-bit – single thread	CineBench R1064-bit – multi-thread
333x9; DDR2-1066 5-5-5-15	1m 28.452s	54.647s	3692	7161 (1.94x efficiency)
378x9; DDR2-1008 5-5-5-15	1m 19.426s	47.988s	4170	7996 (1.92x)
423x9; DDR2-1015 5-5-5-15	1m 12.463s	42.213s	4676	9073 (1.94x)

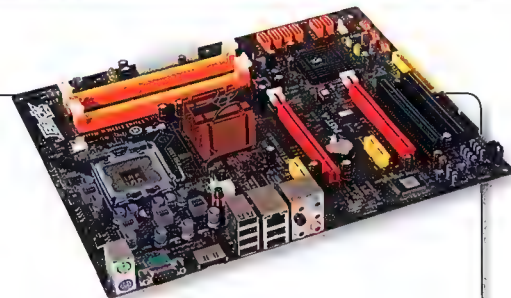


Elitegroup P45T-A

The motherboard that could have been a Ninja in another life.

Price \$TBA Supplier ECS Website www.ecs.com.tw

Specifications Socket 775; Intel P45 chipset; ATX form factor; 1x PCIe x16; 1x PCIe x8; 2x PCI; 2x PCIe x1; 1x EIDE; 1x FDD; 6x SATA; 1600MHz FSB; DDR2-800



This board certainly looks the business. Sadly, the only business here is show business.

The back panel of the motherboard contains six USB ports, four of which are stacked vertically, and this makes plugging in multiple gadgets annoying – especially if you have larger sticks. For a board aimed at enthusiasts, surely they could have put more USB ports here, or even a clear CMOS button.

The area around the CPU socket is very bare, with room for larger heatsinks, and you'll also find solid capacitors here – but nowhere

else. The remainder of the board (save for two others) are old electrolytic capacitors that are less reliable under load, run at a higher temperature, and have a shorter lifespan.

Another strange choice was a four-pin CPU power socket, which reduces stability and capacity for Quad core overclocking. The RAM slots will need the graphics card removed to access. Six SATA ports are present, and about three will be easily accessible when running Crossfire. Power and reset buttons are present.

During testing we discovered that the USB

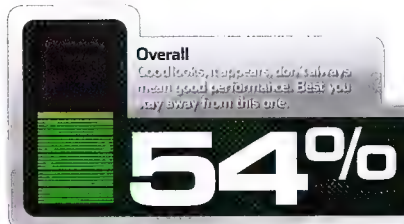
ports refused to work with any mouse or keyboard, but would work with flash drives. The latest BIOS did not fix this issue, so we had to scrounge an old trackball mouse!

The overclocking menu is very limiting, with options few and far between. CPU voltage is not stated, and is simply '+097mV' and other seemingly random amounts of voltage.

With performance down across the board, and some very poor choices, we really can't recommend this to anyone – unless you must have the board for the looks.

Elitegroup P45T-A

	Super PI 4M	wPrime 32M	CineBench R1064-bit – single thread	CineBench R1064-bit – multi-thread
333x9; DDR2-800 5-5-5-15	WOULD NOT COMPLETE	54.852s	3574	6670 (1.87x efficiency)
378x9; DDR2-800 5-5-5-15	WOULD NOT COMPLETE	48.173s	4106	7555 (1.84x)
423x9; DDR2-800 5-5-5-15	WOULD NOT COMPLETE	43.056s	4547	8397 (1.85x)



GIGABYTE GA-EP45-DQ6

The board with every feature – even a kitchen sink!

Price \$335 Supplier GIGABYTE Website www.giga-byte.com

Specifications Socket 775; Intel P45 chipset; ATX form factor; 1x PCIe x16; 1x PCIe x8; 2x PCI; 1x PCIe x1; 2x PCIe x4; 1x EIDE; 1xFDD; 10x SATA; 1600MHz FSB; DDR2-1200

As the premium offering from GIGABYTE, we can only expect good things from this board.

Featuring ferrite chokes and solid capacitors arranged around the CPU socket, and circled on three sides with heatpipes and heatsinks, there is just enough room to install most aftermarket coolers with relative ease. The DDR2 slots are relatively clear, though to install or remove them you will need to remove the graphics card, as there isn't enough room to open them fully.

The eight-pin and 24-pin power sockets are placed in the best spot for ease of use, and an

FDD connector lies alongside the latter. Included with this board is a whopping ten SATA ports! Four of these are right-angled to allow use when long graphics cards are installed.

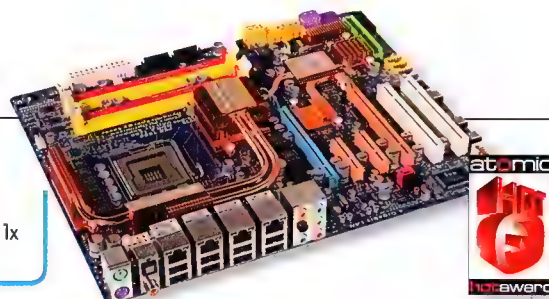
USB and firewire headers populate the bottom of the board, with incredibly convenient power, reset and clear CMOS buttons as well. These are a godsend for any enthusiast or bench.

There are plenty of expansion ports just above here, with the possibility of using PCIe x4 cards. In the tradition of extreme overkill, there are two Realtek chips here, that both give four ports of Ethernet at one gigabit, as well as eight USB

ports plus sound.

This board boasts many overclocking options and full access to all memory options. USB keyboards are disabled in default settings, however. Also notable during testing was the fact that the Northbridge and surrounding cooling got hot to the touch, so airflow is definitely needed here.

All in all, this is a premium product that offers extra functionality, but with similar performance, at an added cost. For the ultimate system, you really can't go wrong with this board.



GIGABYTE GA-EP45-DQ6

	Super PI 4M	wPrime 32M	CineBench R10 64-bit – single thread	CineBench R10 64-bit – multi-thread
333x9; DDR2-1066 5-5-5-15	1m 46.938s	52.71s	3678	7181 (1.95x efficiency)
378x9; DDR2-1008 5-5-5-15	1m 19.903s	47.359s	4187	8121 (1.94x)
423x9; DDR2-1015 5-5-5-15	1m 12.555s	41.854s	4646	9115 (1.96x)



GIGABYTE GA-EP45-DS3R

Budget builders: buy belligerently bemusing board!

Price \$170 Supplier GIGABYTE Website www.giga-byte.com

Specifications Socket 775; Intel P45 chipset; ATX form factor; 1x PCIe x16; 1x PCIe x8; 2x PCI; 3x PCIe x1; 1x EIDE; 1xFDD; 6x SATA; 1600MHz FSB; DDR2-1200

Previous offerings from GIGABYTE have provided very good performance for very little outlay of cash, and this board manages to live up to its predecessors. With the DS3R, many premium features are not present, though there are a few interesting inclusions.

The CPU socket that, while not as well-arranged or cluttered as other offerings, has the bare essentials ready for any CPU you can throw at it – with enough room for the largest of aftermarket cooling. The RAM slots

are equally as bare, though they're in an awkward place for those who often swap out memory as the graphics card will need removal first. The eight-pin and 24-pin power connectors are all in their usual places, and there is an FDD and right-angled IDE connector also on the right hand side of the board.

Six SATA ports occupy the bottom corner, though the top three may be blocked by long dual-slot graphics cards – right angled SATA cables would be a great choice here. Thankfully GIGABYTE predicted this need, and includes two of these cables in the box.

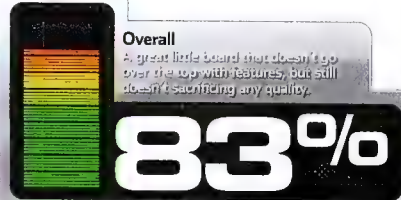
All the usual power, USB and firewire headers

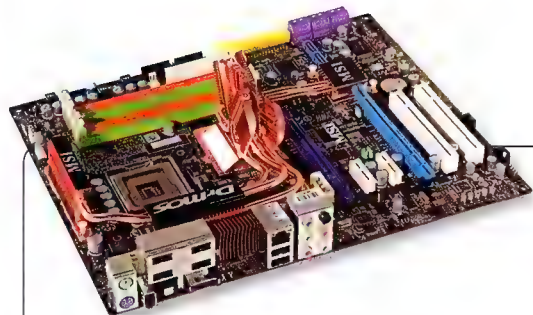
are present at the bottom of the board, except for the audio header, which is placed in a very frustrating location – the middle of the board. Plenty of expansion slots are available for those with older tech.

The PCB is dyed the traditional GIGABYTE blue, with purple capacitors and brightly coloured slots. This certainly doesn't appeal to everyone, but the performance is definitely on par with the rest of the crowd, with a great price that will let even the least knowledgeable overclockers have a go. We definitely like this board, and your wallet will too.

GIGABYTE GA-EP45-DS3R

	Super PI 4M	wPrime 32M	CineBench R10 64-bit – single thread	CineBench R10 64-bit – multi-thread
333x9; DDR2-1066 5-5-5-15	1m 29.341s	52.869s	3697	6775 (1.85x efficiency)
378x9; DDR2-1008 5-5-5-15	1m 18.907s	47.284s	4190	8106 (1.93x)
423x9; DDR2-1015 5-5-5-15	WOULD NOT COMPLETE	42.196s	4686	9057 (1.93x)





MSI P45 Platinum

Atomic loves heatpipes, ever so much.

Price \$240 Supplier MSI Website www.msicomputer.com.au

Specifications Socket 775; Intel P45 chipset; ATX form factor; 1x PCIe x16; 1x PCIe x8; 2x PCI; 2x PCIe x1; 1x EIDE; 1x FDD; 8x SATA; 1600MHz FSB; DDR2-1066

In recent years, MSI has begun to rival GIGABYTE in the 'giant cooling' market, and this mobo is no different. With a very elaborate heatpipe network (manufactured by Zalman no less), culminating in a central volcano of erupting pipes and copper fins, the cooling is so large that it takes up the top expansion slot, and some room on the back panel!

The unfortunate result of the engorged cooling (apart from looking so damn cool) is that larger heatsinks (like the one used in testing) will not fit in all orientations, and may not fit at all depending on how wide it is on all sides. While it may seem excessive, the cooling array became quite warm during testing, due to the power regulation also

contributing to the load.

The heatpipes almost brush up against the DDR2 slots, but there is just enough room to access the modules without removing the graphics card – great for lazy tech writers and enthusiasts alike. 24-pin and eight-pin power are in the usual places, with FDD, right-angled IDE and eight SATA ports (six are right-angled) all lined up on the edge of the board. All ports will be accessible during Crossfire.

Power and reset buttons are available, as well as USB and Firewire headers. There are two PCI slots for those with sound cards or TV tuners, and a dual-slot gap between the larger PCIe slots – great for airflow to the cards when paired up. The back panel features a clear CMOS button that

turned out to get a lot of use during testing.

When we installed this board into our test rig however, we were met with a very sad end. Our first board refused to POST (we guess that the magic smoke leaked out somehow), so a replacement was grabbed. This allowed benchmarks at stock settings, but any amount of overclocking caused the board not to POST, until the CMOS was cleared.

With nice features and eccentric cooling, this board nonetheless can't be recommended right now – unless you have a burning love for heatpipe artwork.

MSI P45 Platinum

	Super Pi 4M	wPrime 32M	CineBench R10 64-bit – single thread	CineBench R10 64-bit – multi-thread
333x9; DDR2-800 5-5-5-15	1m 28.078s	52.345	3716	7165 (1.93x efficiency)

Overall

A realistic heatpipes does not a good board make, especially when it also fails to overclock.

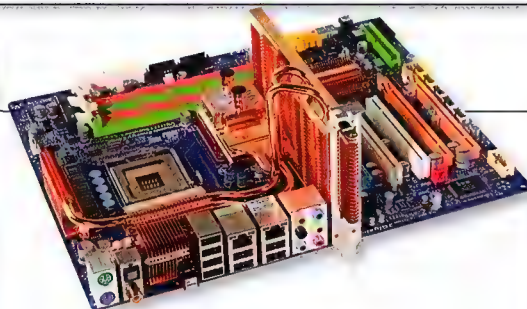
52%

GIGABYTE GA-EP45T-EXTREME

We take a look at the board that has single-handedly caused a world Copper shortage.

Price \$359 Supplier GIGABYTE Website www.giga-byte.com

Specifications Socket 775; Intel P45 chipset; ATX form factor; 1x PCIe x16; 2x PCIe x8; 3x PCI; 1x EIDE; 1x FDD; 6x SATA; 1600MHz FSB; DDR3-1900



The stock chipset cooling is impressive, with an array of heatpipes and capacity for watercooling directly on the Northbridge. But, is it *Extreme* enough? Apparently not, because a further heatsink is bundled with the mobo, and screws directly onto the Northbridge.

The drawback to this (apart from the immense size) is that you lose an expansion slot. This is definitely not a board for the LAN-goer either, since the whole contraption weighs well over a kilogram, and is in fact so heavy that two support braces are installed on

the rear of the motherboard just to stop the thing from snapping in two!

The RAM slots are DDR3, and coloured green and a very odd pink. There are six SATA ports present, two of which are right-angled.

There is an LED POST screen present, which is kinda nifty, but it doesn't display realtime temperature monitoring like the Biostar board. Buttons for those lazy benchers are also present. Frustratingly the audio is wedged into a tiny space and will require some careful manoeuvring.

Crossfire is a welcome feature on this board

with the possibility of dual 4870s or triple 4850s, though they will be quite starved of bandwidth.

The mobo has solid caps, and an array of surface-mounted LEDs on every spare space on the board, that all light up depending on load and other functions.

The BIOS is as easy to navigate and use as most GIGABYTE boards, and the excessive cooling should allow good Northbridge temps when overclocking – just make sure you've got some airflow in the case to use it.

GIGABYTE GA-EP45T-EXTREME

	Super Pi 4M	wPrime 32M	CineBench R10 64-bit – single thread	CineBench R10 64-bit – multi-thread
333x9; DDR3-1066 5-5-5-15	1m 28.154s	54.303s	3703	7113 (1.92x efficiency)
378x9; DDR3-1008 5-5-5-15	1m 18.624s	46.724s	4145	7951 (1.92x)
423x9; DDR3-1015 5-5-5-15	1m 13.070s	42.602s	4652	9095 (1.96x)

Overall

Too extreme for most, underutilised for all but the most hardcore overclockers and benchers.

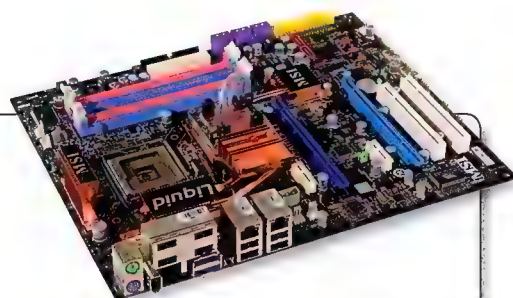
73%

MSI P45 Diamond

The board that should – but doesn't. Or something.

Price \$370 Supplier MSI Website www.msicomputer.com.au

Specifications Socket 775; Intel P45 chipset; ATX form factor; 1x PCIe x16; 1x PCIe x8; 2x PCI; 2x PCIe x1; 1x EIDE; 1x FDD; 8x SATA; 1600MHz FSB; DDR3-1600; X-Fi audio PCIe 1x module



At first glance, you'd be forgiven for assuming that the cooling on this board is less extreme than the Platinum – it's actually quite the opposite. On top of the Northbridge (all covered with cheese tubes) is a transparent plastic cover with nozzles, tubing and clamps included to hook up to any watercooling loop. The benefit of including it here is that the whole cooling array will effectively be watercooled, as the heatpipes connect all the components.

There isn't much room around the CPU socket for larger heatsinks, though water blocks will fit just fine. Support for DDR3 is present, using a strange choice of light pink

and blue. Power, IDE, FDD and SATA are all in the same placements as the Platinum.

The same buttons are also present down there (in the corner most likely to hold such luxuries), but may prove difficult to reach when using Crossfired dual-slot cards.

Moving to the expansion slots, there's only six available out of the usual seven – our guess is that one lane was sacrificed to allow the two eSATA ports on the back panel (reinforced by the presence of a VIA chip in the area). The back panel itself has eight USB ports, two Ethernet, one Firewire, PS/2 ports and a clear CMOS button – but no audio. This is due to the included

X-Fi audio module, interfacing through a PCIe 1x slot. While a strange inclusion, the card offers a hybrid of onboard and dedicated sound, and also supports EAX4.0 – great news for gamers.

Overclocking went without a hitch up until we pushed the FSB over 380 – we had the same issues as with the Platinum. A few (read: about twenty) attempts later and we got to 385, which wasn't stable, however.

With a great idea, and exotic features such as soundcards and watercooling, this board still remains remarkably average.

MSI P45 Diamond

	Super Pi 4M	wPrime 32M	CineBench R10 64-bit – single thread	CineBench R10 64-bit – multi-thread
333x9; DDR3-1066 5-5-5-15	1m 26.939s	55.287s	3729	7179 (1.93x efficiency)
378x9; DDR3-1207 6-6-6-18	1m 16.393s	47.518s	4252	8235 (1.94x)



Motherboard performance stock settings

SuperPi comparison



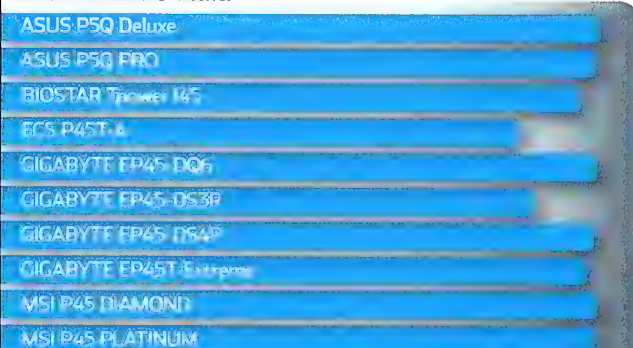
Cinebench R10 Single



wPrime Comparison



Cinebench R10 Multi



And as the dust settles...

Even giant comical lassos can't help us decide this one.

Without resorting to large whimsical ropes, we can definitely say that the P45 chipset is a marked improvement over the P35. Each of these motherboards offer PCIeV2, something that is a great way for making sure that your graphics card isn't bottlenecked – and every board has the capacity for Crossfire. With that, let's pick our favourites for three different categories:



RUMOUR MILL

Rumours have been floating around the internet about the newer Nehalem (Intel's new CPU) boards, stating that some will be reworked to have the chipset next to the CPU socket, and the memory underneath the socket – essentially swapping the two around. This is feasible, as the Nehalem includes a memory controller to allow faster memory access, and also brings Tri-Channel DDR3 support to the forefront. Expect to see more about these motherboards in upcoming issues, and keep a close eye on our brand spanking new website at www.atomicmpc.com.au for any info that can't wait until the next issue.

Value/Budget Performance

WINNER Biostar TPower I45 **RUNNERUP** Gigabyte EP45-DS3R

While the reason you've picked up this mag is because you're a tech enthusiast, sometimes you have to stick to a budget. Maybe a budget gaming system is on the cards, or you want a 'jack of all trades' that can double as a work PC. Either way, the board that we choose is the

Biostar TPower I45.

It is definitely not the cheapest board that we tested, but the results were very solid. It has many premium features such as LED screens, onboard power/reset buttons and even an add-on active cooler for the

northbridge – and can even be used as an extreme overclocking board if you so choose. The performance of this board was also slightly higher than the others, and the BIOS was very easy to use. For the asking price, you really can't go wrong.

Mid-range

WINNER Gigabyte EP45-DS4P **RUNNERUP** ASUS P5Q Deluxe

The midrange category is where most enthusiasts fall into. In this category you get some premium features, and some very good boards, while only sacrificing a small amount of ultra-excessive options. These boards usually offer good overclocking features, as

well as lots of potential for future upgrades. The one we pick for this is the Gigabyte EP45-DS4P.

This board is priced very competitively for the very good features that are present, offering a huge amount of USB ports and a great selection of expansion slots. The

performance of the board is solid, and only improves as you overclock. Onboard buttons are great for benchmarking, and the support for DDR2 all the way up to 1200MHz is very good – allowing support for very high FSB and memory speeds.

Extreme

WINNER Gigabyte EP45T-Extreme **RUNNERUP** MSI P45 Diamond

This is the area reserved for those with the deepest pockets, and the strongest desire to have the absolute best of everything. Every feature under the sun has to be included, supporting the latest and most expensive toys. They are the epitome of tech, and the dream of all lesser mortals to actually own one. Hence we choose the only board in the roundup to include a bloody massive heatsink, as well as more features than you can poke a stick at: the Gigabyte EP45T-Extreme.

With an expansion slot-sized heatsink,

solid caps and ferrite chokes (enough for two motherboards), and support for DDR3 up to a blistering 1900MHz, this board is definitely able to live up to its extreme moniker. Performance is very good across the board, and the BIOS has a wealth of options to play around with to squeeze as much performance out of every component. This board is also great for those with watercooling as you can simply add the northbridge into the loop by removing the rubber caps and attaching tubing – very neat. The price is high, but to be expected for this

kind of over-the-top board.

We've found that the P45 chipset is definitely a worthwhile improvement over the P35, and is a great upgrade choice for anyone. There are so many manufacturers with these boards on the market right now, that you certainly have a lot of choice, and you can't go far wrong with most of them.

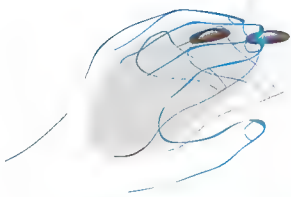
Our eyes now turn to the future, with the upcoming release of Intel's X58 and inevitably their P55 chipset offering a new wave of performance. But if you need a board now, P45 is where you'll look first.

KITLOG

There's nothing sexier than new kit. And whether you need to horde your pennies (Budget), want the most power for your dollar (Performance) or own a small mansion and a collection of sports cars (Extreme), we're here to help with this handy matrix of Atomic recommended products. You may find your needs fall between categories – that's okay, just mix and match to suit your budget! Each piece of kit has been reviewed hands-on in Atomic, so if you want to learn more, look up the issue and page number listed.



We know that the KitLog needs some loving, so we have our team of Atomic elves scouring past reviews to bring this page more fully up to date. Watch this space!



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BUDGET

CPU



AMD Athlon 64 AM2 X2

PRICE \$135-335

Cheap CPUs are a wonderful thing, and the X2s are now wonderfully cheap. The 3600+ is your budget baby at about \$85.

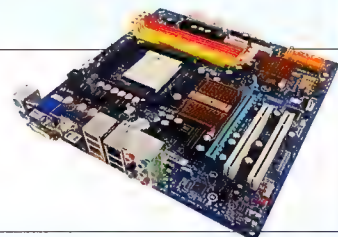
MOTHERBOARD

GIGABYTE AM780GM

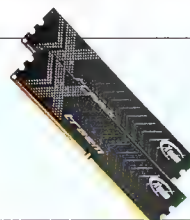
PRICE \$100

This mobo had Josh drooling and dreaming of the ultimate budget media center!

Reviewed in Issue 89 – Page 40



MEMORY



TEAM Xtrem Dark PC2-6400 C4

PRICE \$80

These modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits.

Reviewed in Issue 80 – Page 56

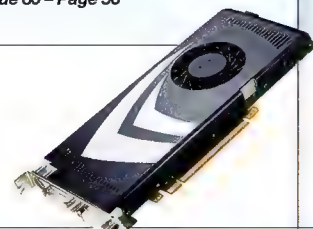
VIDEOCARD

GeForce 9600GT 512mb

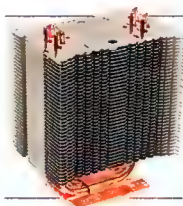
PRICE \$150

It's simple, it's black, and pumps out some pretty pleasing pixels for a very reasonable asking price.

Reviewed in Issue 87 – Page 43



COOLER



Noctua NH-U9B

PRICE \$72

Labs tested to be the top of the cooling game without breaking the bank (or making you sweat – haha)

Reviewed in Issue 89 – Page 36

SYSTEM DRIVE

Samsung 200GB

PRICE \$70

Super quiet and yet still fast, the 200GB Samsung offers excellent value for money.

Reviewed in Issue 69 – Page 40



DISPLAY



Samsung 931C

PRICE \$323

2ms of raging colour gamuts and beautifully smooth tonality that will make you weep with joy and hug strangers.

Reviewed in Issue 70 – Page 56

SPEAKERS

Steelsound 5Hv2

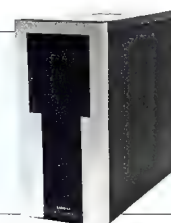
PRICE \$120

Awesome gaming audio performance on a shoestring budget. Phenomenal 'phones.

Reviewed in Issue 73 – Page 43



CASE



Lian Li PC-7S

PRICE \$125

Quality, elegance, refinement and style. The trademarks of a Lian Li case, now available at an entry-level price.

Reviewed in Issue 79 – Page 46

PERFORMANCE

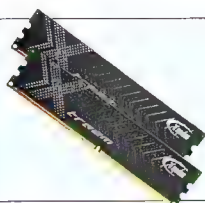
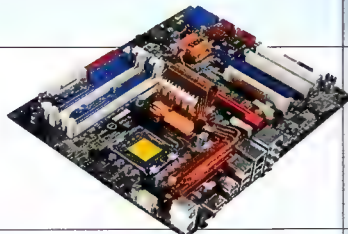


Intel Core 2 Quad
PRICE \$300-680

A processing powerhouse, now affordable and overclockable like buggery. The Q6600 is the best buy, at about \$240.

FoxconnP35 Mars
PRICE \$236

A great board for the enthusiast with a mess of great ideas and good overclocking potential.
Reviewed in Issue 85 - Page 48

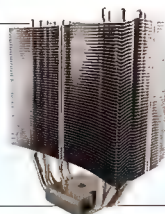


TEAM Xtrem Dark PC2-6400 C4
PRICE \$80

Cheap, overclockable and good lookin' to boot. The modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits.
Reviewed in Issue 80 - Page 56

Sapphire HD4870
PRICE \$325

One of the best price to performance cards on the market. Welcome back Red!
Reviewed in Issue 92 - Page 36



Thermalright Ultra 120 Extreme
PRICE \$75

Tower cooling that will keep your tower cool. Whack a Nexus 120mm fan on for near silent cooling.
Reviewed in Issue 89 - Page 33

Seagate Barracuda 7200.77 1TB
PRICE \$300

Seagate's fancy new technology makes this beast both fat and fast. Mmm, tasty.
Reviewed in Issue 69 - Page 40

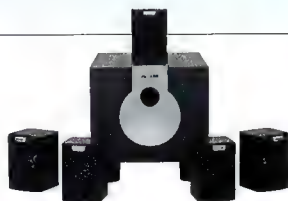


Samsung 244T
PRICE \$999

Brilliance at 24", the 244T offers 6ms gaming, a wonderful gamut and more inputs than an alien hooker.
Reviewed in Issue 69 - Page 48

AVLabs AVL325
PRICE \$165

While it can't hold a candle to the Z-5500D, with a price this low there's no excuse not to jump to 5.1.
Reviewed in Issue 64 - Page 50



Cooler Master Stacker 830
PRICE \$285

Like the Stacker before it, this sensational Stacker stacks sumptuous specifications salaciously.
Reviewed in Issue 61 - Page 36

EXTREME

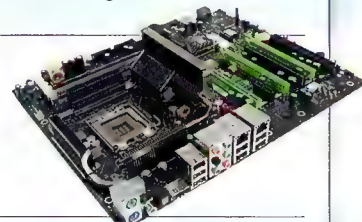


Intel Core 2 Extreme QX9770
PRICE \$TBC

The cream of the overclocking crop, based on the new Yorkfield architecture. Truly, Lord of the CPUs.
Reviewed in Issue 86 - Page 48

XFX 790i Ultra SLI
PRICE \$555

It's an imposing board that offers a host of enthusiast options, performance tweaks. We like.
Reviewed in Issue 88 - Page 40

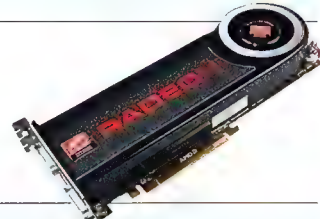


Corsair DHX NV Kit
PRICE \$900

All up one of the most powerful and versatile kits we've seen.
Reviewed in Issue 90 - Page 50

ATI4870X2
PRICE \$650

All the performance of two cards, in one. Makes a lot of heat, but also serious performance.
Reviewed in Issue 93 - Page 32



Coolermaster Aquagate Max
PRICE \$199

The ultimate in out-of-the-box water cooling solutions. For serious seriousness.
Reviewed in Issue 90 - Page 36

WD 3000GLFS VelociRaptor
PRICE \$399x2

Dear lord. The performance king hath cometh, short of whacking in a SCSI. Buy two and RAID 'em.
Reviewed in Issue 90 - Page 52

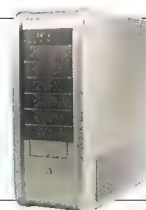
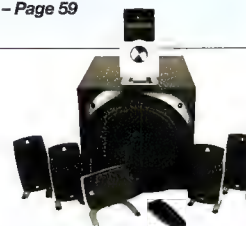


Dell 3008 WFP
PRICE \$2299

It's enough to make a grown man weep and beg. Or, at least, that's what we'd do for one of these simply gorgeous displays.
Reviewed in Issue 88 - Page 59

Logitech Z-5500D
PRICE \$363

Able to play the 'liquid gold' that is DTS 96KHz/24-bit, this 5.1 beast can wreck both home and hearing alike.
Reviewed in Issue 48 - Page 56



Silverstone TJ07
PRICE \$348

The Silverstone Temjin TJ07 is a huge hulking beast that shows you mean business in the finest style. Impeccable finish and plenty of room means win.
Reviewed in Issue 65 - Page 49



Dan Rutter cries the lament of the enthusiast...

Allow me to take you back, way back, to 1992.

Boutros Boutros-Ghali was the new United Nations Secretary-General. Nirvana's performance on Saturday Night Live made clear that Kurt Cobain had a long and productive future ahead of him. Sir Tim Berners-Lee had come up with some goofy hypertext thing for the NeXT that obviously wouldn't catch on. And Commodore released the Amiga 600.

The editorial staff of Australian Commodore and Amiga Review crowded around the A600 we'd just managed to scam for review.

feelings aren't any more accurate.

The best-known way in which J. Random Gamer reaches fallacious conclusions about computer performance is by observing that some tweak or new piece of hardware has raised his 3DMark score by *300 points*... while failing to notice that the old score was 11,000, and the new one is 11,300.

But many people don't even get *that* far.

They reckon, for instance, that their new \$40 mousemat is making them play much better. But they can't even quantify how well they used to play, let alone account for confounding

everyone rich by just printing more money.

Getting back to the nice harmless computer side of the problem: My friends in retail have no problem at all with unscientific customers. Those customers may occasionally ring and complain that whatever they bought last doesn't *quite* seem to have entirely licked the problem, but then they'll probably buy some other random thing. A fool and his money are welcome almost everywhere.

My own motto, though, is that if something's worth doing, it's worth knowing what you're doing, and why, and how you can tell if it's really working.

Unfortunately, I'm having some trouble fitting that motto on a T-shirt. ☹

Now you know Dan's motto — why not share yours!
dan@atomicmpc.com.au

... a surprising amount of the time, the decide that the problem really has been solved — because they never really quantified it...

Well, technically we didn't really crowd, since there were only two of us.

Eagerly, we booted the new cut-down Amiga.

"Oh yeah. That's faster," said Andrew, the Editor.

I, the Assistant Editor, did not disagree.

We didn't, you see, at that point know that the new baby Amiga was actually clocked at exactly the same 7MHz as the previous Amiga 500. We thought it could very easily be faster. It'd pretty much *have* to be faster, wouldn't it; it certainly wasn't any cheaper than an A500, so if it wasn't faster then it'd probably be a huge commercial failure.

So we thought it was faster.

But it wasn't. And was indeed a huge commercial failure.

Why did we think the baby Amiga was faster? Because we were fooling ourselves. We weren't even attempting to do science. We were just eyeballing things and going with our gut feelings.

An iPod Shuffle's now clocked more than ten times as fast as an A600, but people's gut

variables like quality of the opposition, how well rested/cafeinated they are, and so on.

More importantly, people buy more RAM when video card fill rate is what they need, or a new video card when games are loading slowly because they're spread in fragments over the inner tracks of their hard drive, or a new hard drive to speed up a computer that's thrashing like crazy because it's not got enough RAM.

And then, a surprising amount of the time, they decide that the problem really has been solved. Because they never really quantified it in the first place, and because they don't want to look like a tit for spending \$500 on almost-nothing.

And, of course, the same lack of analysis can get you into big trouble in more important areas of life than how good your computer is. Every day, people sink their life savings into worthless shares because Uncle Larry reckoned they were a sure thing, or head off to some crystal-waver to have their cancer treated because a pamphlet from the health-food store said doctors kill more people than guns, or vote for someone who promises to make



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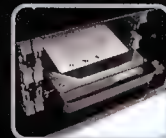
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M/B type: ATX, Micro ATX
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Expansion slot: 7



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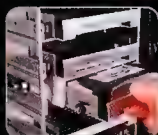
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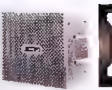
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TUTORIAL

HANDS-ON TUTORIALS FOR THE TECHNICALLY MINDED

The time has come, Atomicans, to talk of many things. Of clocks and busses and frequencies, of cabbages... okay, we'll stop. This month we have an overclocking guide written by Vito Cassisi that gives you a basic grasp on the art that is tweaking every last iota of performance out of your CPU and RAM.

Then we take you through the steps of cutting up a case to make it your very own, with Justin guiding us through a decidedly Atomic-esque mod. Atomic.edu makes the way through our redesign to let Chris Taylor guide you through all the courses available at Monash, while Zara Baxter voices her opinion on Microsoft's sneaky new marketing ploy.

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The Art of Overclocking CPUs and RAM

Vito Cassisi walks you through everything you need to know to get the most performance from your PC.



Overclocking, as many of you know, is the process of increasing a device's clock speed above stock or manufacturer specifications. This process dates right back to the beginning of personal computers, however the methods have constantly changed throughout computing history. Swapping out quartz crystals, changing motherboard jumpers, or altering the CPU itself were just a few common methods used over the past years.

Fortunately, modern overclocking merely requires a few BIOS tweaks and a spark of silicon luck. This tutorial will delve into the theoretical and practical aspects of overclocking, allowing you to unleash your savage system, so you can let it run wild and unrestricted like it should. Just don't wet yourself.

DISCLAIMER

Overclocking is an activity that involves altering a device to function beyond its specifications. This will void warranty in many cases, and if performed incorrectly, may also damage system components. Although this guide teaches preventative steps to minimise risk, it's best not to overclock something which you cannot afford to replace.

Why should I overclock?

Overclocking provides extra performance for as little as, well, nothing. Yes, there's nothing like a freebie, but potential performance gains depend on the CPU, RAM, motherboard and cooling system being used. Many budget components overclock well, and are often purchased by enthusiasts to save money. By overclocking these cheaper components, equal or better performance can be obtained in comparison to the expensive equivalent – the only potential cost being aftermarket cooling to keep everything running smooth.

The current Intel Core 2 architecture responds

Note

Pre-made OEM PCs (such as HP and Dell variants) commonly use custom motherboards that limit or completely restrict overclocking capability. Overclocking is best left to custom built PCs, but if you're keen, there may be a documented work-around on the Internet. Google, as always, is your friend.

well to overclocking, even with stock cooling and voltages. AMD Phenoms also overclock well, although typically to a lesser extent, particularly when using stock cooling. Whether using an AMD or Intel platform, there's no better way to get your money's worth than overclocking.

The Battle Plan

Before we delve into combat in our BIOS battleground, we need to establish how our PCs communicate and process data via the motherboard. Figure 1 shows a typical modern Intel platform.

The basic components of concern when overclocking this platform include the CPU, FSB, and RAM. As pictured, the FSB links the CPU to the Northbridge, and the RAM is linked to the Northbridge/memory controller via the memory bus. A

'bus' is a physical electrical connection between components. The Southbridge connects to the I/O panel at the rear of the motherboard, and also communicates with storage devices, integrated graphics processors, PCI expansion slots, and the BIOS, to name a few.

To find the clock speed of the CPU and RAM, two simple equations must be used:

$DDR\ RAM\ clock\ speed = FSB\ clock \times RAM\ divider \times 2$ (Double Data Rate)

$CPU\ clock\ speed = FSB\ clock \times Internal\ CPU\ multiplier$

Both the RAM and CPU depend on the FSB, and as you've probably guessed, increasing it will overclock each component. However, to get the

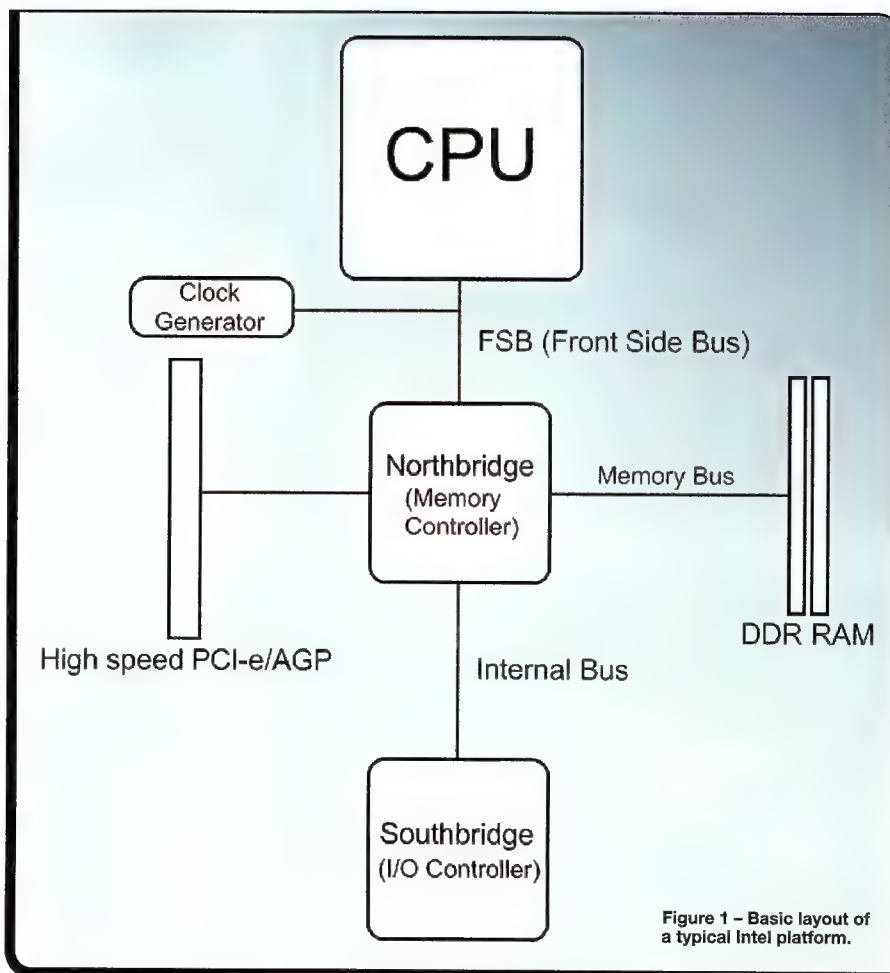


Figure 1 – Basic layout of a typical Intel platform.

most out of your system some tweaking will have to be done using RAM dividers and the CPU multiplier. The FSB of Intel systems is quad pumped and often represented this way. For example, an advertised 1600MHz FSB is in reality only running at 400MHz actual clock speed ($1600/4$). More on 'pumping' below.

The AMD Platform

Before delving into the gritty and mystical nature of RAM dividers and CPU multipliers (hey, that rhymes!), let's pay some respect to the innovative AMD platform. The process of overclocking a modern AMD platform is similar to that of the Intel equivalent, however, the terminology differs and the system bandwidth must also be factored in. Figure 2 presents a typical modern AMD platform.

The AMD platform has a memory controller on the CPU unlike current Intel systems which use a memory controller located on the Northbridge. There is no FSB in AMD systems, but its HyperTransport bus (HTT Bus) works in a similar way. The Southbridge functions identically to that of the Intel platform.

To find the clock speed of the RAM and CPU use these equations:

DDR DIMM clock speed = HTT clock x RAM divider x 2 (Double Data Rate)

CPU clock speed = HTT clock x Internal CPU multiplier

Due to the nature of AMD's integrated memory controller, two more variables must be considered – the HT Link and HT Multiplier. The HT Link is the clock speed, or bandwidth, of the HyperTransport bus system. This system is double pumped.

HT Link = HTT Bus x HT Multiplier

The general consensus from overclockers is to keep the HT Link at stock speeds. This ensures system stability while maintaining high performance.

So what's this term 'pumping'?

Pumping is name used to describe the process of transmitting data on the rising and falling edges of a clock signal. By doing this, more data can be transferred on each clock cycle, the result being a faster transfer speed. Double pumping refers to two bits of data transferring per clock cycle, while quad is four bits per cycle. Quad pumping uses out-of-phase electrical signals to transmit two bits of data on the falling edge, and two bits of data on the rising edge of the clock signal. DDR RAM is double pumped, hence the name Double Data Rate. Clock speeds shown in pumped form are commonly referred to as the 'rated' speed of the device, while in non-pumped form it's known as the 'actual' speed. When overclocking, we work with 'actual' speed.

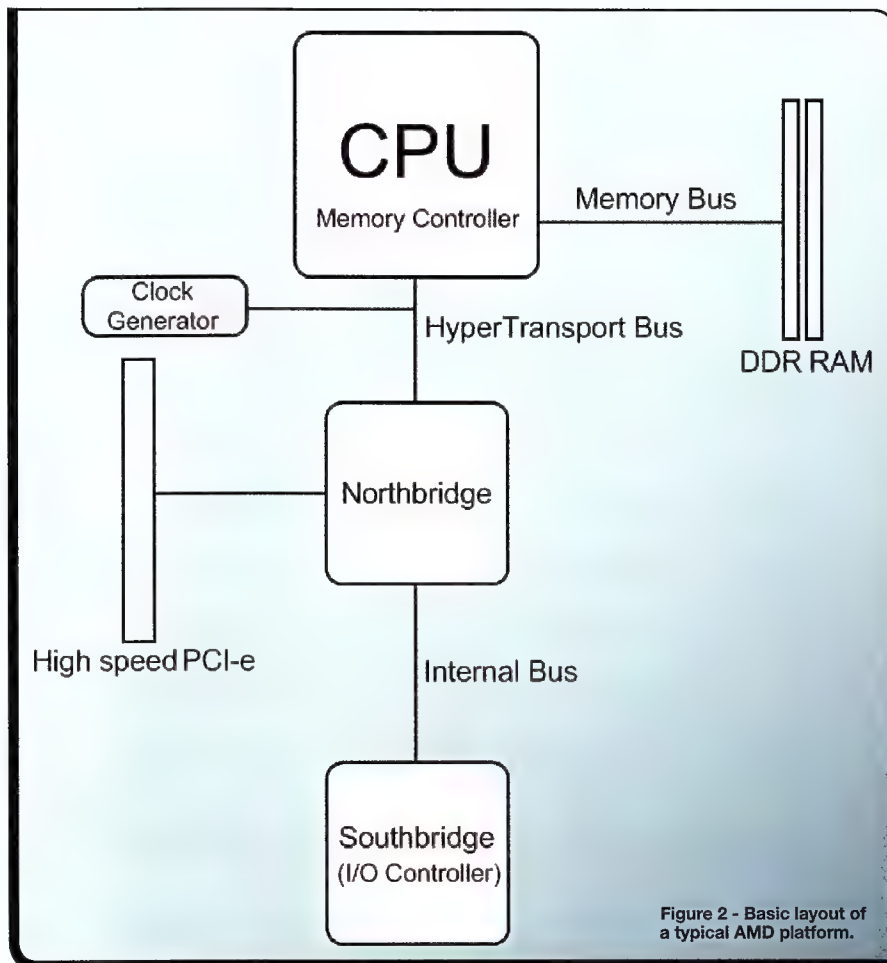


Figure 2 - Basic layout of a typical AMD platform.

Reducing bottleneck – The RAM divider and CPU multiplier

Intel systems are reliant on the FSB when determining CPU and RAM speeds. Likewise, AMD systems depend on the HTT Bus. It becomes an issue when the CPU reaches its stable limit before the RAM does, or vice versa. To tackle this, RAM dividers and the CPU multiplier are used.

The CPU multiplier is a ratio built into the CPU which determines its clock speed when multiplied by the FSB (Intel) or HTT (AMD). Modern CPU multipliers are usually semi-locked, meaning you cannot raise the multiplier, only lower it. High end CPUs either have a high multiplier (allowing bigger overlocks on smaller FSB/HTT clocks), or an unlocked multiplier, granting the user the ability to choose their own multiplier value. The usefulness of the CPU multiplier is best shown by example.

Let's say we have an Intel system, a Q6600 (2.4GHz stock) and 1066MHz DDR2 RAM, in which we've overclocked the FSB. The Q6600 has a maximum multiplier of 9x. We've previously tested the CPU and know it'll function at 3.2GHz, but have raised the FSB to match the RAM. The FSB is therefore set to 533MHz:

Note

On AMD systems the divider is often shown as 200MHz for 1:1. This is because the HTT bus on AMD systems is designed to be 200MHz by default on all CPU models. Therefore 400MHz, for example, is equivalent to a 1:2 FSB:RAM ratio, 250MHz is a 4:5 ratio, 300MHz is a 2:3 ratio, etc.

$$\begin{aligned} \text{DDR DIMM} &= 533 \text{ (FSB)} \times \\ &1/1 \text{ (RAM divider)} \times 2 \text{ (DDR)} \\ &= 1066\text{Mhz} \end{aligned}$$

But we have an issue, the FSB is very high, and the default CPU multiplier of 9x would equate to:

$$\begin{aligned} \text{CPU clock speed} &= 9 \times 533 \\ &= 4797\text{MHz (4.8GHz)} \end{aligned}$$

There are two solutions to this problem. The first, and easiest, is to lower the multiplier so that it matches a known stable speed. In this case it's 3.2 GHz and can be achieved with a 6x multiplier:

$$\begin{aligned} \text{CPU clock speed} &= 6 \times 533 \\ &= 3198\text{MHz (3.2GHz)} \end{aligned}$$



This would now be stable, but in reality it's very hard to get the FSB to this speed. So how would we achieve a 3.2GHz CPU and 1066MHz RAM clock speed another way? The answer is RAM dividers.

RAM dividers (also known as 'FSB:RAM' or 'RAM:FSB') is the ratio between the FSB and RAM (or HTT and RAM for AMD systems). This allows higher RAM speeds on lower FSB clocks. Let's take the above example using these dividers:

DDR RAM clock speed = 356 x 3/2 (RAM:FSB) x 2

= 1068MHz

CPU clock speed = 9 x 356

= 3204MHz (3.2GHz)

The system is now overclocked without putting strain on the FSB. To overclock further, raise the FSB and adjust settings accordingly.

System stability

One of many factors working against overclockers is instability. This is caused by weak/distorted signals during data transfer or processing, and is often solved by increasing the voltage of the component. System instability can cause system crashes, booting issues, or in some cases file corruption. Instability is often hard to detect when the system is under little load, which is why programs such as Orthos Prime, Prime95, and OCCT were created. These free programs place your CPU and RAM under constant high load allowing instability to be detected. If the software or OS reports

an error or crashes, the system is unstable. To rectify stability, you can either increase the voltage or lower the overclock.

Booting issues may be caused by the PSU not supplying enough voltage to system components. Ensure that you have a high quality PSU; generic PSUs are not recommended for overclocking, heck - just don't use them full stop.

We need more power, Captain!

Increasing the clock speed of computing devices often leads to system instability, especially with higher overclocks. This is primarily due to a lack of

voltage. Voltage can be increased via the BIOS for the CPU, RAM and Memory Controller Hub (aka Northbridge on the Intel platform). The important terminology to know includes:

CPU Voltage = vCore

RAM Voltage = vDIMM

Northbridge/Chipset Voltage = vMCH

Increasing the voltage may improve stability, but it also increases heat output. Always increase voltage by small increments, and check temperatures and stability at each increase.

System temperatures and cooling devices

It is important to monitor temperatures when overclocking, particularly after increasing voltages. The maximum advised temperature for a CPU is 65°C under load; after this, aftermarket cooling is recommended. Software used to monitor temperature includes (but is not limited to) SpeedFan and Core Temp. Running one of these applications alongside a stress test is a great way of measuring the heat output of your system.

Aftermarket cooling devices are regularly used by serious overclockers. Methods of cooling include air, water, vapour phase change and DICE (dry ice), or even liquid nitrogen. The first three options are permanent solutions whilst dice or In2 must be replenished often - it is only used by extreme overclockers for short periods of time. Air and water solutions are most common due to availability and price; but cannot achieve sub-ambient temperatures unless bundled with a chilling unit. Vapour phase change is expensive but can achieve sub zero temperatures.

You may be wondering, what is the advantage of having a highly cooled system? The answer has everything to do with electrical resistance. The hotter a conductor is, the higher its resistance becomes. Effectively, more voltage is then required which in turn creates additional heat. In short, cooler means better.

Vdrop and Vdroop

In relation to voltages, vdrop and vdroop are

Software Overclocking

Advantages:

- Can stress test the PC immediately after altering the clock speed.
- Can monitor temperatures, vdroop and vdrop in realtime.

Disadvantages:

- Overclock is only effective after Windows boots up.
- Limited voltage control.
- No RAM divider control.

Recommendation:

Use this to tweak the FSB/HTT bus after working with the BIOS method

BIOS Overclocking

Advantages:

- Full access to available voltage options, dividers and other goodies.
- Overclock is effective from POST (Power On Self Test).

Disadvantages:

- Stability testing is tedious, you must boot into Windows to stress test.
- May not be able to monitor vdroop and vdrop in realtime.

Recommendation:

Overclock using this method first, then progress to software overclocking if every extra MHz counts.

terms used to describe voltage variance. Vdrop is the difference between the voltage value set in the BIOS, and the actual reported voltage when the system is idle. For example, Setting 1.4v in the BIOS, but having readings show up as 1.39v in monitoring software such as CPU-z.

Vdroop on the other hand is the difference between idle voltage readings and full load readings. Generally, the less vdroop and vdrop the better. Regardless, it's not advised to fix this issue via modding or BIOS features. Vdroop in some instances can be reduced using pencil mods; this is not advised because vdroop serves a purpose and is done intentionally (more information on this topic can be found here: <http://tinyurl.com/64yusr>). The only effective solution is to buy a higher quality motherboard.

Recovery Procedures

With any system tweaking there will be faults. It's hard (if not impossible) to determine the limit of your hardware without pushing it there first. Sometimes overclocking goes a little too far and your system will refuse to enter the BIOS, but don't fret, there is a solution. By resetting the CMOS on your motherboard the system will go back to default settings. This will allow the PC to boot once again, and your BIOS will once again be accessible. To reset the CMOS, follow the instructions in your motherboard manual. If resetting the CMOS doesn't work, and/or you get abnormal beeping from your PC (aka more than one beep), you may have a faulty piece of hardware. Check this beep code in either the motherboard manual or on the Internet to find the culprit. If there is no sign of life at all, the PSU is most likely at fault and needs to be replaced.

Prepare for battle – Software or BIOS overclocking?

There are two methods of overclocking; the first via Windows using software such as SetFSB, the second via the system BIOS. The advantages and disadvantages of each are outlined below. Both methods can be used in conjunction with each other.

Overclocking via the BIOS

The BIOS is home to all your overclocking options, whether they be simple overlocks such as FSB alterations, voltage adjustments and multiplier modifications, or even the advanced region of the spectrum with RAM timings and latencies. Often the most arduous task is finding required settings in the jumble of vague English mess that is your average BIOS!

Some motherboard manufacturers tend to conceal overclocking options and therefore require a key combination to unlock them. On GIGABYTE motherboards this is Ctrl+F1. If overclocking options cannot be found on your particular motherboard, confirm that there are such options by doing some research on the internet; they may be hidden.

Overclocking is a simple method of finding the maximum stable limit of the CPU, RAM and FSB, then match the settings to suit all components. This is achieved by following the general steps outlined below.

1. Set the RAM divider to 1:1 (or 200MHz on AMD systems)
2. On AMD systems, lower the HT multiplier by one integer. This will allow some overclocking headroom when adjusting the HTT bus.
3. Certain motherboards don't lock the value of the PCI and PCI-e frequencies. Ensure they don't change from 33MHz and 100MHz respectively. Modern motherboards generally lock these values by default.



4. Raise the FSB/HTT bus by increments of 5-10MHz. After every increment, save the settings into the BIOS and boot into Windows. Run OCCT for 15 minutes, if this is stable, restart and increment again, otherwise move on to the next step once instability kicks in.

5. There are three possible culprits for this instability. Either the FSB/HTT bus, CPU or RAM. If the RAM hasn't bypassed its stock speed yet (which is usually the case), then this can be ruled out as a suspect.

To rule out the CPU as the problem, lower the multiplier by one integer and run OCCT. If this is stable, then the CPU was the problem. Raising the vcore may help, but watch the temperatures when stress testing. If it's still unstable... then the RAM is likely to be the issue.

If the RAM is overclocked, increasing the vDIMM slightly may help. If not, lowering the FSB/HTT bus (or loosening RAM timings (see issue 86, page 84) is the solution since it's on a 1:1 ratio and cannot be set to a lower clock speed. If it hasn't been overclocked, the process of elimination points the finger at the Northbridge/MCH. Attempt to rectify stability by increasing the vMCH by the smallest increment available. If voltage increases provide no aid, revert the FSB/HTT bus to its last stable setting.

6. If the RAM hasn't yet reached its limit, experiment with RAM dividers until you reach a stable overclocked speed. If the CPU hasn't reached its limit, increase the CPU multiplier by the smallest increments available. Stress test at each increase.

7. Once all experimentation and overclocking is complete, boot once again into Windows and open Prime95. Run it overnight to ensure any instability is found, and adjust your overclock accordingly.

Remember that increasing voltages creates heat. Do not allow the CPU to exceed 65°C under load. Always research your components before overclocking and learn from other people's triumphs and mistakes.

FSB/HTT bus settings including DDR, PCI-e and PCI frequencies. The first slider controls the FSB/HTT bus, the second alters PCI-e values. Increasing the PCI-e bus rarely improves system performance, so it's probably best to ignore it.

"A list of clock generators and their accompanying motherboards can be found on the SetFSB homepage."

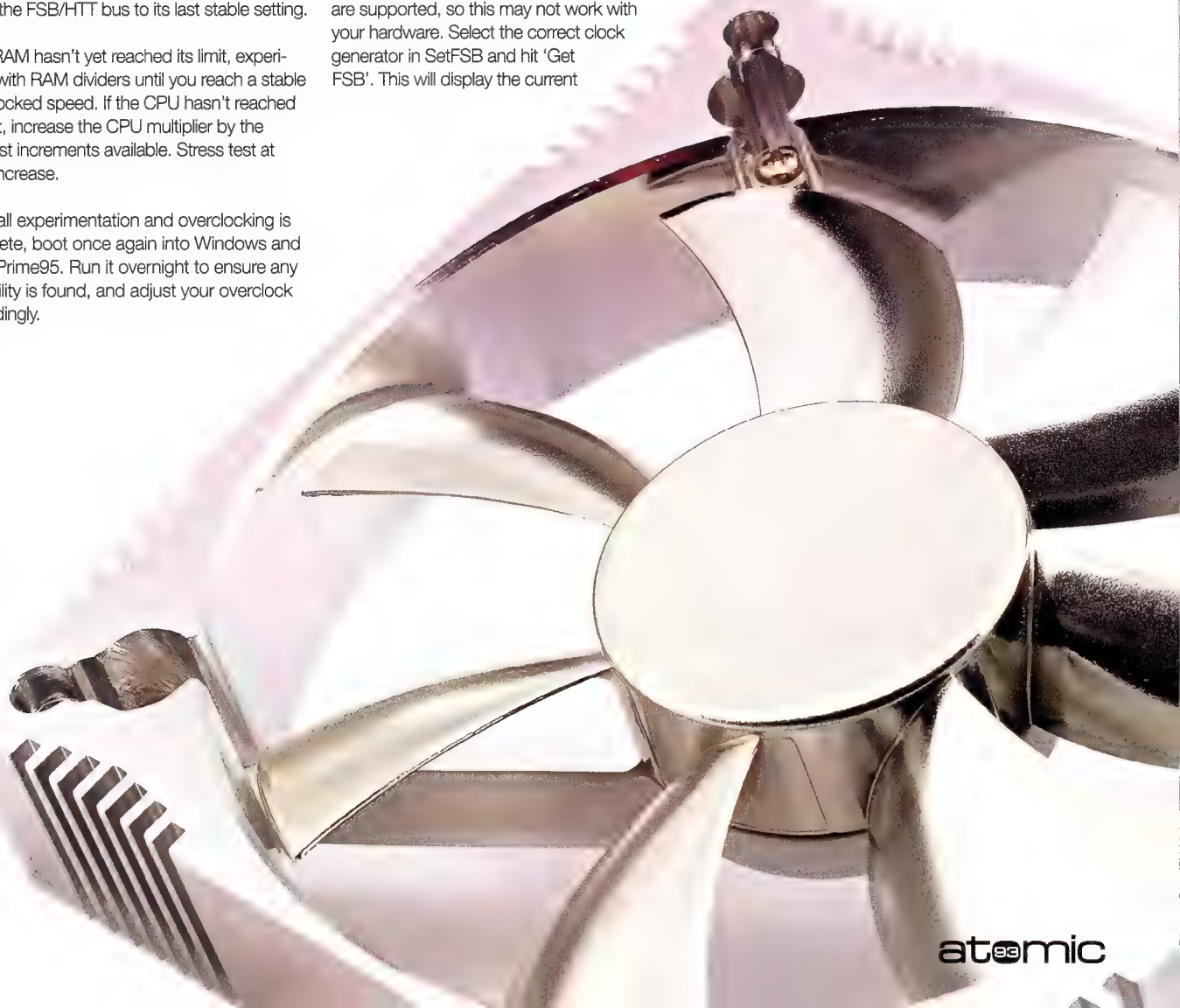
Overclocking via Software

The method for overclocking via software applications is much the same as the BIOS. Using the software SetFSB (for FSB/HTT bus adjustment), CPU-z (to view clock speeds) and CrystalCPUID (to alter voltages and the CPU multiplier), you can alter device settings within Windows. This software is freeware – a quick web search will provide download sources.

SetFSB alters the FSB based on a clock generator value. A list of clock generators and their accompanying motherboards can be found on the SetFSB homepage. Not all motherboards are supported, so this may not work with your hardware. Select the correct clock generator in SetFSB and hit 'Get FSB'. This will display the current

Using the theory outlined within this tutorial (yes, you need to fiddle with the settings now), adjust the FSB/HTT bus and regularly test stability. If the need arises, use CrystalCPUID to adjust the vcore and/or CPU multiplier – if successful, change the value in the BIOS to make it permanent. When done run Prime95 overnight to check for stability issues.

And there we have it! An overclocked beast ready to pwn the masses! 



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Backlit Engraved Window

Justin Robinson delivers an Atomic flavoured case mod, just-in time (pun most definitely intended).



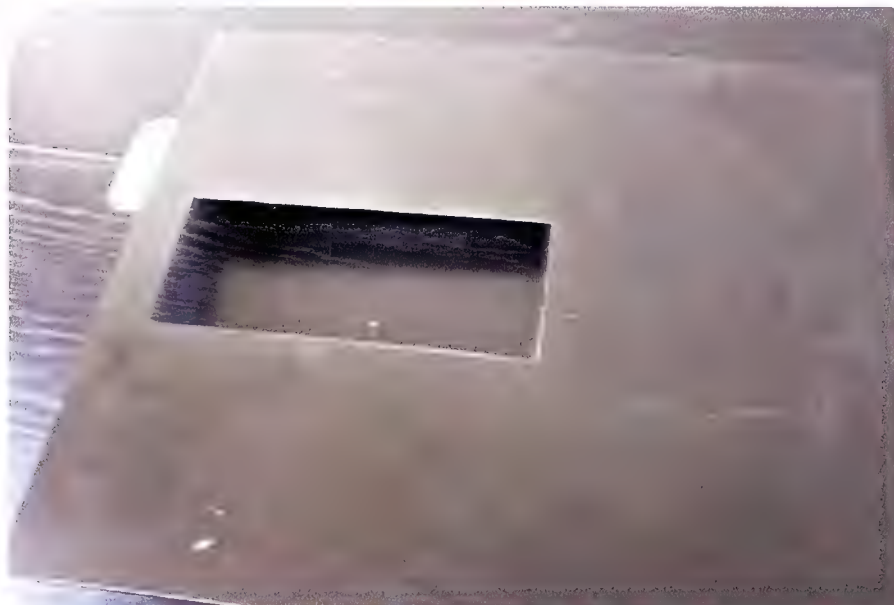
◆ **DIFFICULTY** ◆
INTERMEDIATE



Many Atomicians have the very latest and greatest in tech, with beastly performance and intricately threaded cabling. But what most don't have is a case that can be immediately identified as 'theirs'. It's very easy to pick up a pre-modded case (in fact these have flooded the market in recent years), but for just a little more time and effort you can have something that is specific to you – something that no mass-produced case can match. So naturally when Anyware sent us a stylish Lian Li A17B, and PC Case Gear sent us some UV Acrylic, we had a job to do.

Planning makes perfect

The core of every mod is an idea. It's usually best to get these ideas down on paper, so the first step is to make sketches and take measurements – get as much of this done **before** you start modding. Choose your design (we've chosen the latest iteration of the Atomic logo, but you can choose whatever you'd like), choose the case and start gathering the supplies. We cheated a



The window has been cut and sanded to remove rough edges.

Suppliers

PC Case Gear

<http://www.pccasegear.com/>
Ph 61 3 9584 7266

- 1x AC Ryan AcrylPanel 3mm - 480x480mm UV Green, \$25.00

Jaycar

<http://www1.jaycar.com.au/>
Ph. 61 2 8832 3100

- 4x 3mm Green LEDs, Cat no ZD0124, \$19.80
- 4x 3mm White LEDs, Cat no ZD0140, \$7.80
- 8x 20ohm resistors, Cat no RR0531, \$0.38
- 2x 3mm Heatshrink in black and green, \$2.60
- Aluminium tape, Cat no NM2862, \$9.95

Anyware

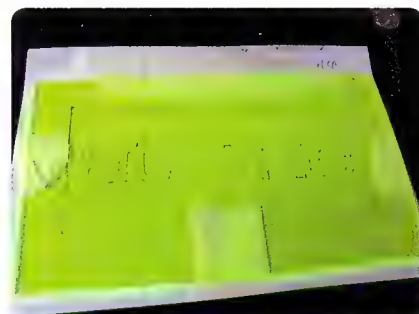
<http://www.anyware.com.au>
• Lian Li PC-A17B Case

little, and have used an Atomic sticker as the basis for our design – but you can just as easily sketch something on the computer and print it out.

The first step once our design was ready was to take the side panel off the case. Flip it onto the front, so that you are working on the inside of the case, as if you scratch the inside it won't matter – who's going to see it? Using a lead pencil, we lightly marked out the shape of the window that you we're going to cut. Make sure that you're as accurate as possible, and that all edges are straight (try using a ruler to make sure that it is squared, as there is nothing worse than a wonky window).

The next step is to start cutting on the most accessible edge, cutting on the inside of the shape you're going to cut. This is because if you take too much, you can't go back, but if you don't take enough you can just sand away the excess. Once

you've cut the window out, take some 400-grit sandpaper and rub this over the edges to smooth it, and make it shine.



A small piece of Perspex over the design, ready for engraving.

Disclaimer

Whenever you pick up power tools, cutting and grinding instruments, or even a can of spray paint, you are putting your general wellbeing at risk from some form of industrial level accident. We take every precaution by wearing appropriate safety equipment, using tools with respect and within their limits, and by not inhaling the contents of glue and paint containers. We suggest that you should follow a similar regime, and seek professional assistance and guidance if you are attempting a task outside of your skill set.

NB. Atomic MPC and staff are not responsible for your safety or longevity.

Tools

The tools used in this tutorial are mainly those found in the average workshop, including a soldering iron, Dremel, and pliers. The main requirement is a decent bench or table, providing a solid, flat surface to operate on.



Once the outline has been done, the middle can be filled in. Try using different strokes of the tool to create different patterns!

Your window to cool!

We're finished with the side panel for now, so set it aside somewhere safe. The next step is to take the same design we used for the window, but enlarge it by about 4cm on each side. This is to provide extra material to stick onto the case, and so that the window doesn't fall out of the hole you just cut. If you're using a rotary tool like a Dremel here, use a slower speed as high rotation will

Once you've got the outline of each shape done, the middle can be filled in. We used a diagonal line pattern here, but anything from dots to small circular motions can create something different and eye catching. If you've got some Perspex offcuts, these are great for practising on before you finally decide.

We've gone slightly beyond your traditional window mod with this one – the two separate parts of the Atomic logo are on separate pieces of

and you'd be left with a rather impressive window that gives a good view of the techy goodies inside. But what if you wanted to add another layer of eye-candy? The answer, of course, is lighting.

Light me up

Lighting can be used to light up the whole case from the inside, or can be used directionally to light specific areas of interest. With a window you can mount these lights at the edges of the Perspex, and the light will 'catch' on the engravings. To do this is very simple – just drill four small 3mm holes in the edges of the Perspex, one for each side. Make these deep enough so that the LEDs can fit in snugly, but not so deep that the window cracks. Once the crevasses are made for the LEDs, you can begin with the soldering.

Soldering involves heating up two separate pieces of metal, and joining them together with a material called (funnily enough) solder, which is made up of an alloy of tin and lead. Since we're working off the 5V line of a standard computer PSU, we need to do some math. The basic formula for finding the resistor needed to reduce the voltage to a safe level is this:

$$R = (V - L) / mA$$

Essentially, you take the LED voltage (L) away from the source voltage (V), and divide it by the amount of milliamps that the LED uses (mA). This will give you a number in ohms, which gives you the resistance that you'll need to get. Since our LEDs were 30mA at 3.5V, we grabbed some 20ohm resistors.

These were soldered together by rolling one leg of the resistor around a small screwdriver, then placing the anode through the resulting hole and soldering them together. The anode is different to the cathode, or negative leg of the LED and you can tell this by looking at the 'flag'

"Lighting can be used to light up the whole case from the inside, or can be used directionally to light specific areas of interest."

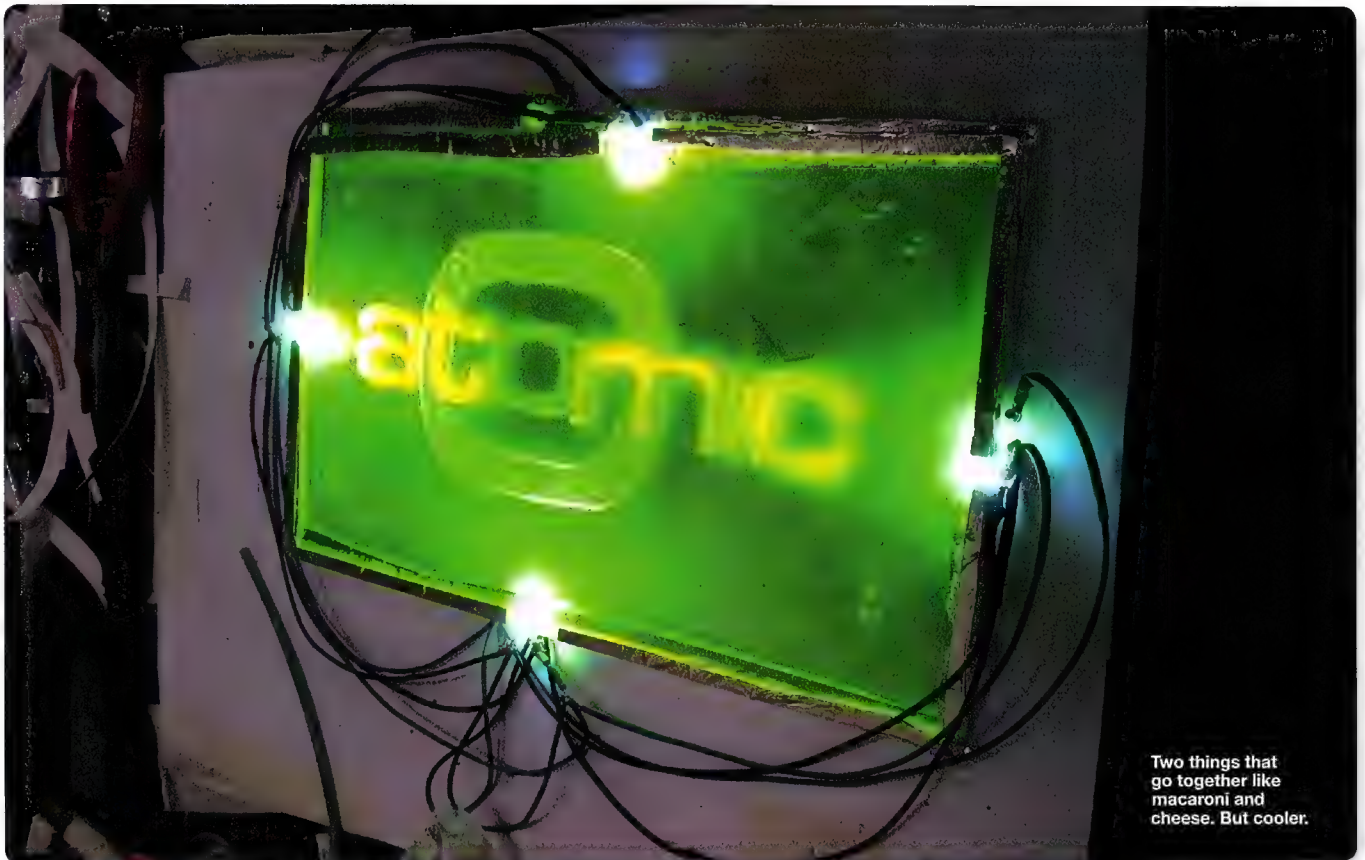
just melt the Perspex into a blobby, fiery mess – something that isn't the best for either the tool or for your nostrils. Place this piece of Perspex over the design, and hold it in place with either a clamp or some tape. Grab the engraving tool that you've chosen (can be anything from a Dremel to a purpose-built engraver, or even a powered drill if you're confidently insane enough), and engrave the outline of the shape in the direction of the tool's movement to keep a straight line.

Acrylic. Not only does this mean two pieces, but this also means that they both must line up correctly – so accuracy is a must. However if you feel that a single window is more than enough, that means that you only have to do half the work. Using a combination of patterns and layers, you can create a visually stunning window – that no-one else can claim to have.

The windows are both relatively complete. If you wanted, we could stop the tutorial right here,



Pimpin' up the windows with some old-school lighting.



Two things that go together like macaroni and cheese. But cooler.



We plugged it in, and then this happened.

attached to the leg inside the LED – this means that the leg without the flag is positive. Always solder the resistor onto the positive part of a circuit, as this is the safest and most reliable method.

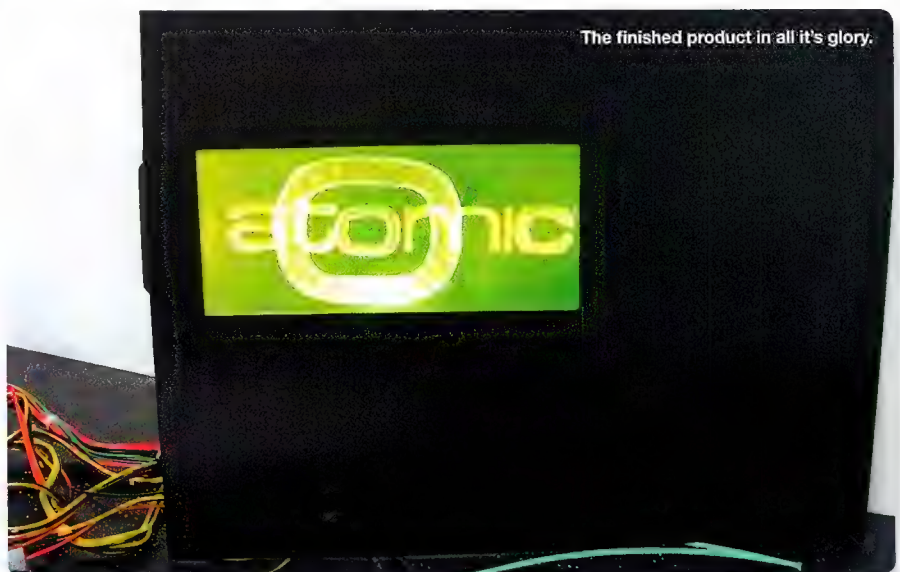
Once all the LEDs are installed and held in place (by hot glue, silicon or your preferred method), aluminium tape can be applied along the edges of the Perspex. This bounces the light around inside the window, and causes the engraving to stand out much more. We scavenged a molex connector from a fan, and soldered the red and adjacent black wire onto the green and black wires respectively, which acted as positive and negative. While we left our editor staring deeply into the glowing recesses of this window (so... pretty... -ed), we finished the other window and joined the two together, producing something like this:

Individually, the two windows look pretty cool.

But light them up on top of one another, and you get a really cool effect that we can assure you will turn heads at any LAN party. We joined these two panels together using some silicon (much like the stuff that you'd use for sealing up fish tanks), and then siliconed this onto the case. A heavy power supply was placed on the back to keep some pressure on them, and a fan was pointed at it to let it dry. About half an hour later, we brought it upright, which brings our tutorial to a close.

This mod is quite easy to do, and the results can be bloody amazing. We only spent a couple of days at this project and even we were impressed – take a bit more time and things can only look even better.

You're only limited by your imagination and creativity, as well as the tools you have at hand – but the important part about modding is that you can improvise with any other tool that will do the job. And once you're finished, make sure to post a thread and pictures up on our forums! (E)



The finished product in all its glory.

Monash University



In the latest of our ongoing series exploring what educational institutions have to offer, Chris Taylor looks at Monash University.

This month, we're taking a close look at what Monash University has to offer to prospective information technology student. Monash University has campuses located throughout the state of Victoria and abroad. There's a campus in Johannesburg and another just outside Kuala Lumpur.

In recent years, Monash University has put considerable effort into revamping its information technology offerings. Whereas once there was a Bachelor of Multimedia, Bachelor of Network Computing, Bachelor of Computing, Bachelor of Information Systems and Bachelor of Information Technology, each with a selection of majors, there is now the all-encompassing Bachelor of Information Technology and Systems. This, plus the Bachelor of Business Information Systems, Bachelor of Computer Science and Bachelor of Software Engineering rounds out Monash University's current range of undergraduate degrees.

Bachelor of Information Technology and Systems

In the name of efficiency, Monash University recently rolled up several undergraduate

programmes into one. The result is the three-year-long Bachelor of Information Technology and Systems (BITS), which offers students the opportunity to choose one or two majors, depending on how well you juggle electives, from ten different options. Depending on your chosen area of study and whether or not you opt to study overseas, you'll find yourself in Berwick, Clayton, Gippsland, Kuala Lumpur or Johannesburg. The entry requirements vary slightly depending on which major you plan on undertaking. The 2008 clearly-in ENTERs for Commonwealth Supported Places range from 70.00 (Multimedia Applications) to 74.85 (Security). Applicants must have passed both an English unit and a Maths unit. Note that it is possible to minor in all but two of the below fields – Applications Development and Networks and Business Systems.

Applications Development and Networks:

Similar, in a way, to the old Bachelor of Network Computing, the BITS (Applications Development and Networks) involves a bit of programming and a lot of networking. You'll find object-oriented Java programming, operating systems, information systems, software engineering, data communications, security and commercial programming.

This major is offered both off-campus and at Gippsland. Career prospects for graduates include systems designer, systems analyst, project leader, web developer, programmer and database administrator.

Business Systems: Essentially a business course with a strong technical undercurrent. Areas of study include information systems, statistical analysis, computer modelling of business decisions, e-commerce systems and data mining. Possible careers include systems analyst, information systems manager, project manager, business analyst, e-commerce consultant, IT consultant, analyst programmer and database administrator.

Internet Systems: Run at the Caulfield campus, the BITS (Internet Systems) focuses on web development. Possible careers include internet developer, Java or .NET developer, corporate webmaster, mobile applications developer and mobile commerce developer.

Information Management: A major targeted at those interested in dealing with masses of information in the corporate or public sector. Among





other areas of study, students cover project management, information organisation, information architecture, metadata and knowledge management. And, when they graduate, they are able to take a job as a librarian, records manager, archivist, information consultant, web content manager, knowledge manager or information architect. Furthermore, students can opt to gain professional recognition from the Australian Society of Archivists, Records Management Association of Australasia and the Australian Library and Information Association.

Information Systems: For those looking at becoming web developers, systems analysts, information systems managers or project managers, the BITS (Information Systems) is the way to go. Like the Bachelor of Information Systems that preceded it, the units for this major are offered at the Caulfield campus.

Multimedia Applications: Monash University's Bachelor of Multimedia has been split into two majors of the BITS – this and Multimedia Games

Development. A BITS (Multimedia Application) could get you a gig in as modeller and animator, an educational software developer, a games developer, an audio/video producer, sound editor, interactive programmer, special effects engineer or web developer. The Berwick campus, still home to all of Monash University's multimedia offerings, is fully

“In the name of efficiency, Monash University recently rolled up several undergraduate programs into one.”

fitted out with the appropriate studios and labs.

Multimedia Games Development: While you'll also cover graphics and animation in this major, the focus is very much on programming. You'll tackle both Java and C++. You'll also take a look at artificial intelligence and crafting narratives in multimedia. Graduates can expect to find a job as a games engine or tools programmer, graphics or special effects programmer, audio programmer, artificial intelligence

programmer, games designer, games tester or multimedia developer. As with the Multimedia Applications major, Multimedia Games Development is run only at the Berwick campus.

Net-centric Computing: Covers security, network protocols, data communication, wireless computing, mobile computing and distributed systems development. Graduates can expect to land a job as a network administrator, internet developer, corporate webmaster, corporate server administrator, Java developer, .NET developer, mobile applications developer, mobile commerce developer or mobile games developer. BITS (Net-centric Computing) is offered at both the Kuala Lumpur and Caulfield campuses.

Security: Aimed at those looking to land a gig in areas such as information security analysis, information security engineering, network security management, security solutions management and application security analysis, design and implementation. Students cover data communications, ASP, Ajax, C++, network administration and network security.

Systems Development: The program-

ming major. Students of the BITS (Systems Development) will cover UNIX, Java, J2EE, XML, SQL, C++ and .NET. Students can expect to graduate and land a job in such areas as programming and web development. As noted earlier, it is possible, in some instances, to complete a double major. Whether you can do this depends on the majors you choose and how skilled you are at juggling units. In the case of some combinations, approval from the

lead the way in technology

Study Information & Communication Technology at Swinburne

Swinburne offers students a wide range of business and technical ICT degrees that prepare students for a variety of challenging and creative careers.

Swinburne offers a range of courses in:

- Business Information Systems
- Computing
- Information Technology – Scholarship Program
- Network Design & Security
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Monash University Clayton Campus


university is required as attempting two majors would mean you have to complete more units than is otherwise allowed. Approved combinations include:

- Applications Development and Networks/Business Systems (Gippsland, Johannesburg and off-campus).
- Information Management/Information Systems (Caulfield).
- Information Management/Internet Systems (Caulfield).
- Information Management/Net-centric Computing (Caulfield).
- Information Management/Security (Caulfield).
- Information Management/Systems Development (Caulfield).
- Information Systems/Internet Systems (Caulfield).
- Information Systems/Net-centric Computing (Caulfield and Kuala Lumpur).
- Information Systems/Security (Caulfield).
- Information Systems/Systems Development (Caulfield).
- Internet Systems/Net-centric Computing (Caulfield).
- Internet Systems/Security (Caulfield).
- Internet Systems/Systems Development (Caulfield).
- Net-centric Computing/Security (Caulfield).
- Net-centric Computing/Systems Development (Caulfield).
- Security/Systems Development (Caulfield).

Bachelor of Business Information Systems

As the name suggests, the three-year Bachelor of Business Information Systems (BBIS) is a business-oriented information technology course. Graduates of the BBIS are seemingly held in

high regard, as maybe half of the course's students end up earning \$36,000 scholarships and spending time at two 22-week industry placements. This is a course for those who want to come up with information technology solutions for businesses.

Given the course's focus, you'll learn about marketing products, end-user training, client relationship management and the like. You'll also cover the core units of the BITS – basic coding, networking, databases, project management, systems analysis and design, computer systems

“As with the BBIS, the opportunity to engage in a stint of industry-based learning is available to some students.”

and information technology in organisations. The 2008 clearly-in ENTER for the BBIS was a little higher than the BITS, but we advise those interested in this course to try their hardest during their VCE – the higher your score, the more likely you are to receive the afore-mentioned scholarship and industry placement.

Bachelor of Computer Science

Run at the Clayton campus of Monash University, the three-year Bachelor of Computer Science covers a wide variety of topics, from the design,

coding and maintenance of software right up to advanced studies in computer graphics, artificial intelligence, cryptography and user interfaces. Graduates can expect to get jobs as software engineers, games developers, systems analysts, technology consultants and algorithm designers. They may land positions researching artificial intelligence, bioinformatics, robotics, networks and cryptography.

As with the BBIS, the opportunity to engage in a stint of industry-based learning is available to some students. According to Monash University, the selection criteria include not only one's academic performance, but career interests, employment history, maturity, interpersonal skills, enthusiasm and initiative. For Atomicans living abroad, take note – the industry placements are only offered to local students. Two double degree programs are available – a Bachelor of Computer Science combined with a Bachelor of Science and a Bachelor of Computer Science combined with a Bachelor of Arts, the latter of which would allow you to get into such areas as cognitive science.

Bachelor of Software Engineering

The four-year Bachelor of Software Engineering is offered only at the Clayton campus and covers abstract the mathematical foundations of software engineering, problem solving, software processes and lifecycles, software quality control, the writing of documentation, programming and software development methodologies. Depending on each student's academic performance in the first three years, what the fourth year involves varies. For some, they'll simply do a

few more units and complete a year-long studio project. For those that perform well, the opportunity to complete the degree with Honours is offered. All students, though, are required to complete a 12-week stint of full-time, paid employment that is in some way relevant to their field of study.

According to Monash University, students usually do this over the summer break between the third and fourth years. Possible careers include games development, web developer, programming specialist, database designer, software engineer, software architect, software consultant and software developer. 



MONASH University



We can has science?

Microsoft elegantly demonstrates why marketing and science don't mix.

While being a product reviewer is far from an exact science, I used to work as a research microbiologist and I know about experiments.

Microsoft probably do, too. But you wouldn't know it from their latest excursion into marketing Vista: Mojave.

Microsoft ran a so-called experiment where they asked people who hadn't used Vista to rate Vista based on their knowledge of it, then use Microsoft's shiny new OS, Mojave, and rate it. Finally, they revealed that Mojave is in fact ... ta-dah ... Vista!

This could have been really awesome. What

for software testing, though, as long as you're careful not to introduce bias.

So Microsoft was trying to perform a blind experiment. They relabeled Vista as 'Mojave', as an attempt to eliminate the bias people may have about Vista. They even measured the bias that the trialists had against Vista – most people rated Vista between 0 and 4 out of ten, ouch! By asking them to use a "new version of Windows", and labelling it Mojave, they may have introduced a different bias, but we'll overlook that for the moment.

What made me cringe was the way they

Anyone who has ever sat through an Apple product tour knows that having an expert to hand helps you understand the potential of a gadget as well as making the features of a gadget look incredibly simple to master. Sometimes, they even are.

Not surprisingly, the trialists in the Mojave experiment rated Mojave pretty highly, scoring an average 8.5/10.

But you can't really call something a user trial if the trialists don't get to actually, you know, use the product.

Mojave: a desert of scientific enquiry. Is Microsoft desperate to give Vista some positive buzz? Our exhaustive in-house testing concludes that 9/10 Atomic employees think so. ☹

Double-blind experiments are used for new drugs and medical trials...

could be better than discovering that your less-than-stellar preconceived notions of an OS were completely undermined by your love of actually using it? Zing! Pwned by Vista!

Sadly, Microsoft wanted Vista to look good so badly that they bungled it.

The way to conduct this kind of thing properly is a blind experiment. That means the product's identity is concealed from the consumer who is using it, to remove any bias they may have about the product. Blind experiments are usually used for comparisons between someone's regular brand and a competitor. Coke versus Pepsi, for example. By removing labeling and asking you to drink both and rate both, the experimenter discovers whether you prefer the taste of your regular drink, or whether you just buy it because of the label.

In a blind experiment the researcher knows which brand is which; in cases where they don't, it's known as a double blind experiment. Double-blind experiments are used for new drugs and medical trials, where, if the experimenter knew which product was being given to which experimental subject, it might skew the results. Blind experiments are plenty tricky enough

conducted the user trial. Software usability is generally a pretty intensive business. You sit a user in a room with the software, and an experimenter asks them to do a set of tasks. The trialist talks their way through what they are doing, as they do it: "I'm looking for a start button, in the bottom left corner" "I click the menus to see what kind of options the software has." At the same time, the experimenter is recording what the trialist says and any notes about body language or emotion. They're also monitoring where they look using eye-tracking software and a web camera. Sometimes the whole trial is viewed through a two-way mirror or video footage is taken. At least five trialists should be used to get a decent result.

How Microsoft did it was to sit each of its 120 trialists next to a Windows Vista expert. The trialist didn't get to set their fingers on keyboard or mouse – instead, they told the Microsoft guru what they would like to do, and the Microsoft guru did it for them. The gurus knew Vista inside-out, so they could do it very quickly and smoothly, while talking the trialist through how to do it. After this, the trialists were asked what they thought of the new operating system.

Zara Baxter still hasn't blinded anyone with science, but is willing to conduct double-blind experiments to see if it can be done.
zbaxter@pcauthority.com.au





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GAMEPLAY

GAMES, GAMING AND GAMERS COVERED ATOMIC-STYLE

We've only had a few games around Atomic that have disrupted us, but when *Far Cry 2* showed up all work stopped, and all eyes were glued to the screen. Hollingworth has an exclusive look at this next blockbuster hit, while Logan looks into some *Pop*. We don't mean the American version of soft drink, but rather a colourful indie title made for the Nintendo Wii.

On top of all this we still have a look at *Soul Calibur 4*, *Fracture* and a wrap-up to *The Force Unleashed* (also known as 'Why Star Wars Should Be Real'). And as a final cherry on top of the games-laden metaphorical cake that is the following section, we have the usual comedy stylings of Logan to keep you filled for a whole month.



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Win one of five Space Siege action packs!

Space Siege for PC is a science fiction action-RPG developed by Chris Taylor and Gas Powered Games, the creators of *Dungeon Siege I & II*. Play as Seth Walker and save the last survivors of the human race from being annihilated by a seemingly unstoppable Alien force. Atomic and Sega have got one first prize of a copy of the game plus a shiny new GeForce 9600GT graphics to give away, plus four runners up prizes of the game itself. Want RPG action?

www.atomicmpc.com.au/competitions



Bubbles of fun

Logan Booker chats to Aussie dev Nnooo about Pop, and the gaming potential of Wiiware and the iPhone.

New frontiers – there's more to it than the bottom of the sea or the endless expanses of space. Before Xbox Live Arcade, Playstation Network and most recently, Wiiware, the primary realm of the casual and indie game developer was the PC. Low start-up costs, a flexible platform and the internet beating out anything Microsoft, Sony or Nintendo could offer a small-time studio or one-man operation.

The last few years, however, have seen a monumental shift of this mindset. With piracy rampant on our beloved machine, and the fast evolution of online services for consoles, the cut-throat market of lounge room boxes doesn't look so bad. Snagging your own slice of the action is becoming cheaper and easier. The aforementioned companies are doing their best to rope in even the tiniest of devs, in the hopes of unearthing the next Geometry Wars, Braid, LittleBigPlanet or LostWinds.

Nic Watt, creative director at the Balmain-based Nnooo, decided he'd embark on his own adventure to reap the rewards of the ever-growing casual audience. The first milestone in that journey was Pop for Wiiware.

Getting started

Before Australia, Watt was living it large in London working for EA as a designer. When his partner got the call to head to our shores, Watt decided to follow suit. With a bit of cash saved up he decided to found a studio to work on downloadable console games.

"In July 2006 Nnooo started, which was mostly me building contacts in the industry and trying to become approved to develop for one or more consoles," explains Watt. To begin with, Nnooo had its sights set on the Xbox 360 and Xbox Live Arcade. It had a title in development, called Blast, which Watt believed would be





a perfect fit for the service. Events, however, didn't transpire in XBLA's favour.

"When we were looking at XBLA it was very early days for the service and a lot of people had applied to become developers," explains Watt. "So for us it was a hard and frustrating experience, and ultimately was what made us decide to focus on Wiiware." The demands to get a development kit from Microsoft were high – a demo, full design document and concept art were the minimum requirements just to purchase the hardware. "For us, that was too risky, as to build a demo to a decent level of quality would cost a lot of money and there was no guarantee that the game would get published," says Watt.

Not that it would matter, as news came

through that Nintendo had approved Nnooo for its upcoming Wiiware service. Development kits were purchased, Blast put on the backburner, and Watt came up with the idea for Pop.

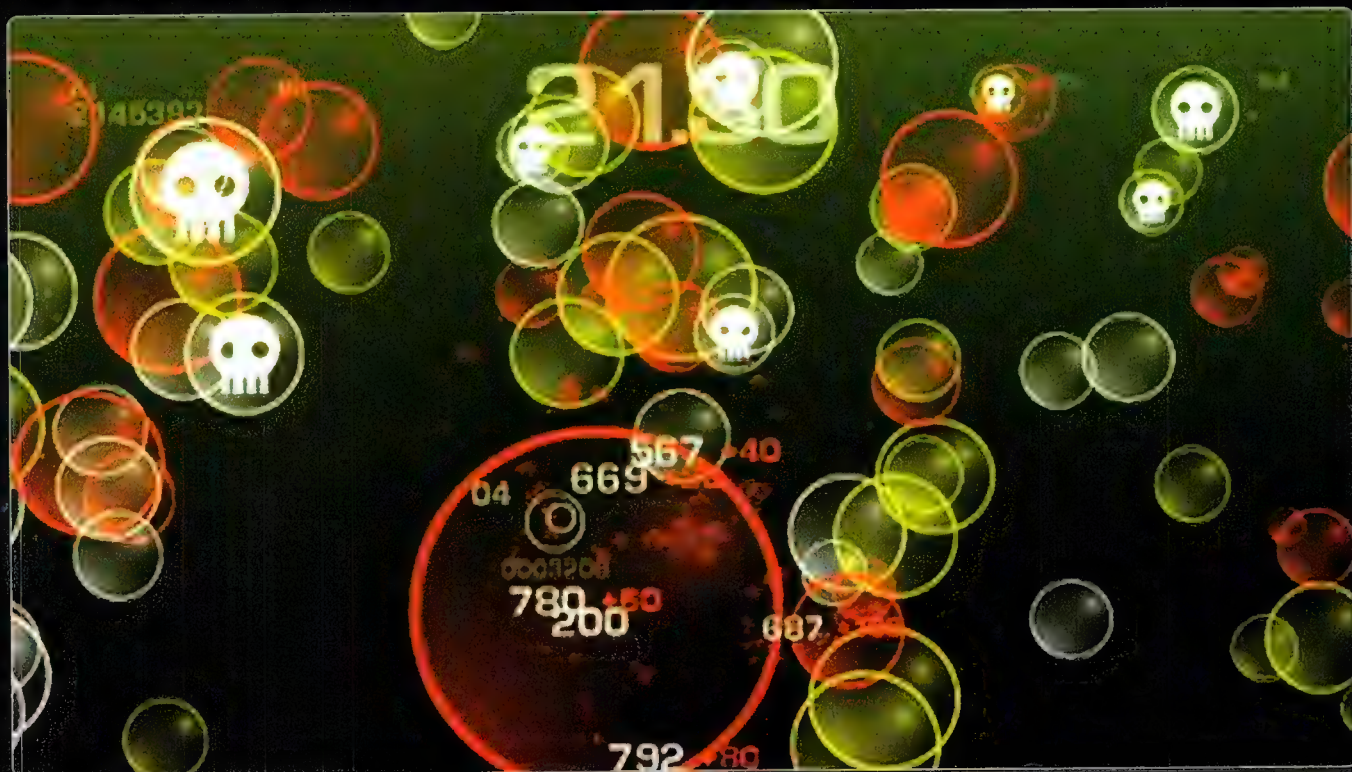
Collecting bubbles of the same colour gives the player a score multiplier, and power ups and direction changes keep things interesting.

Form and function

Pop was a three-letter word and kooky palindrome – until Watt got his hands on it. The creative director had certain expectations for

Nnooo's first title: "[It had to be] something simple and fun; something anyone can play and which has enough depth for core gamers to get into and enjoy; something which can use as many of the features of the Wii as possible so we can learn and ultimately move onto bigger and better things." Watt took inspiration from the XBLA titles Lumines and Geometry Wars, but focused on the elements that made these games appeal to both casual and hardcore players. The Wii remote also had to be involved, and it couldn't be a massive project that would take years to develop. "So with that I thought 'could I make something fun where you point and shoot at bubbles?' And that's what Pop is all about. Up to four players can swing their Wii remotes at the screen and make bubbles explode. Collecting bubbles of the same colour gives the player a score multiplier, and power-ups and direction changes keep things interesting. An intriguing concept, and enough for Watt to start putting in the hard yards. From this idea, Nnooo grew from one man serving as producer, designer, financier, artist and marketer to a five-man

team including an audio engineer and three programmers. Work officially got underway in April of 2007 and ended around January of this year. Between then and the May launch





of Wiiware, Pop went through months of bug fixing, polishing and of course, Nintendo's approval process.

Hard Wiiware

It's no secret that the Wii is the runt of the performance litter compared to its next-gen brothers, the Xbox 360, Playstation 3 and to a degree, the PC. Not that this stopped Nnooo from considering all its options.

"The PS3 we decided against because the hardware was very costly and it was not clear how easy it was going to be to actually get a game approved and published," explains Watt. "Furthermore, part of the attraction of the Wii was doing new types of games that the

controller allows, whereas the PS3 and Xbox 360 ultimately provide a similar experience to previous generations." The perceived hardcore audiences of the PS3 and 360 also proved to be a turn-off for the creative director.

"The PC on the other hand is a lot simpler for us to make and release a game for. However as a start up you are going to find it really hard to reach an audience and in particular compete with piracy and all the free online game sites which exist."

In the end, there's no cheap and easy way to get into the market as a serious game developer. Watt says if you want to do it, be prepared to invest time and money, no matter which platform you end up on.

For Nnooo, that platform turned out to





be the Wii and, while it's no Halo 3 or Metal Gear Solid 4, Pop had its own challenges to overcome.

"Obviously [the Wii] can do less graphically and it has less storage but these are things you can design for. For example, we spent a lot of time optimising Pop so that it would fit in 16MB, which means users can fit more games on their machine!"

Otherwise, the console proved perfect for Nnooo's needs.

"We used a lot of the features of the Wii including Connect24, which allows us to send any of your friends messages to inform them how you are doing in Pop (at your discretion obviously). Realistically, for us the main aspect it provided over the Xbox 360 or PS3 was the controller. Pop would not have been possible on either machine due to the way you interface with the game."

Watt also has nothing but praise for the support Nintendo provided Nnooo. Along with the developer kit and software, an online network gave the company a quick way to get their questions answered.

"These questions can be read and answered by not only Nintendo but also any other approved Wii developers, so you get a lot of support... It also allows all Wii developers to be able to voice concerns over any areas or features, which if dealt with individually may be ignored."

Watt mentions that the software development kit is built on the GameCube SDK. "This means that coming to the Wii as a new developer makes it easier as you are starting with a good solid base."

Watery end

Pop didn't quite make the Aussie (or should we say PAL) debut of Wiiware, thanks to localisation issues. Once these were ironed out the game appeared on Nintendo's service for the tasty sum of 700 Wii points, or \$10.50 in real money.

Watt's satisfied with the final result, and Pop has sold well enough to cover the costs of its development. Soon, there will be enough to fund the developer's next title. Even with this success, is there anything the creative director would change about Nnooo's debut title?

"We learnt a lot from Pop and had to make

a few judgement calls on features to make sure the game got out on time. We had ideas for four bonus rounds of which we only managed to include one; a mode where you could just play the bonus rounds against friends which also got cut; and some graphical effects we couldn't get running at a decent frame rate in the time we had." In terms of gameplay, it's nothing major, and we think Pop's more than fun enough without them. Mostly, Watt's just happy Nnooo was able to get the game out in time for the launch of Wiiware.

This sentiment appears to be reflected in players who, according to Watt, have given Pop the thumbs-up. Perhaps the most-loved feature of the game is its multiple play modes – if you want something highly competitive, you can pop bubbles for points against three friends, but, if you just want to watch pretty liquid explosions on-screen, a special 'chill' mode removes the scoring aspect and lets the game run free... as it were.

Now, Nnooo has its eyes on the iPhone, and is in the process of porting the title to Apple's convergence device. As for the company's future titles, Watt plans to develop something new every three to five months. Ambitious, yes, but we have nothing but high hopes for the enthusiastic Australian developer. 

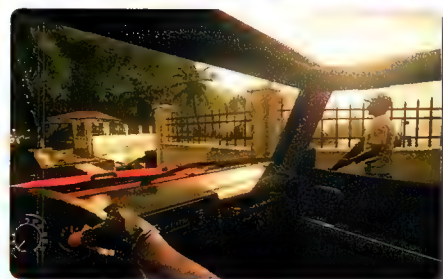
Pop, meet iPhone

The iPhone! It has a gaming SDK, and the high-resolution screen and touch screen are perfect for something like Pop. Unsurprisingly, Watt agrees.

"Obviously the iPhone is not as powerful as the Wii and does not have big a screen, so we're changing the way the bubbles spawn and so forth to match the touch screen." Really though, the creative director is happy with the progress the adaptation is making, and he sees no reason why Nnooo won't continue to develop for the device.

"Apple has taken a very different angle with iPhone development than most games platform holders. For example on the PS3, Wii or Xbox 360, each game you do needs to go through strict certification tests. The iPhone does not require this; it means we can turn software round and get it out to the user quickly. It also means we can get a patch to our users quickly, should we want to push out new features or bug fixes." In this way, Watt compares the iPhone to a melding of the PC and a console. Apple is also "much more hands-off", which Watt says gives the developer a lot of freedom.





Far Cry 2 [PREVIEW]

David Hollingworth gets lost in the underbrush and has to fight his way out...

The devs and other good folk at Ubisoft are a little touchy about Far Cry 2. This is not because they are worried about the game - on the contrary, they're keen to get it out to the gameplaying public as soon as possible - but rather because they are sick and tired of hearing about Crysis. I spoke to local Ubisoft reps recently, and if they are never again asked if FC2 is a Crytek game, or developed on the Cry engine, it'll be too soon. This, they are eager to say, is a whole new technological ballgame.

And it's one helluva ballgame at that.

Most of you will already know the basic premise, but for those who have just awoken from a four year coma, I'll briefly sum up what we know (also, the Liberals lost, FYI). Jack Carver, the first game's hero, is out of the picture, and so is the idyllic Pacific setting. Instead, you play a hard-bitten mercenary type looking for work in the happiest place on earth if you happen to be a hard-bitten mercenary type - Africa! It's your task to find employ by the warring factions of a small and very poor

African nation, while trying not to piss off all the other factions, and possibly make a few friends along the way. In reality, it's more complex than that, but spoilers aren't our business.

Okay, they kinda are... Rosebud is his sleigh.

I watched the rain fall in Aaaafricaaaa!

Story aside, though, there's still a lot to talk about in what is already shaping up to be a stunning first person shooter. At the risk of getting headshot by the aforementioned Ubisoft types, Crysis is a really obvious comparison, but our initial feeling after spending some quality time with preview code is that Far Cry 2 will go a lot further towards being the next gen shooter we've all been waiting for and that Crysis didn't quite deliver.

Nomad's adventures against aliens and evil Koreans were fun, and the environments in Crysis were nothing short of stunning (and still getting better and better as the hardware promised us at release is now finally showing

up). But there was still the feel that the game was little more than an elaborate tech demo. For all of that island jungle's green majesty, there was a real emptiness to the environment. Except for chickens. There were lots of those.

FC2's African jungles and grasslands, on the other hand, are teeming with life. Birds fly overhead, water buffalo block roads, and at night even more animals prowls out amongst the high grasses. Assuming you've not set them (the grass or the animals) on fire that is.

Much has been made of FC2's realistically propagating flame effects, and while they may look good in trailers and in screenshots, neither can really get across what a major gameplay element it really is. Not only is it an outstanding new weapon in your arsenal (being chased by annoying AK-wielding tribesmen in a technical? just set trees and grass on fire and you're pretty safe), but it's also very chaotic, and makes the big firefights that can so easily erupt around any corner a whole new proposition every time.

Case in point: in one fight during our play through we were beset by about half dozen South African mercs, and was holding our own until we heard the very roar of God behind us and our avatar's health started dropping like a dropping thing. Turning around, we were confronted with a roaring wall of flame, which had erupted after a stray round had knocked over a 40-gallon drum with some burning wood in it. As this was happening in a boarded up shanty town, the grassfire quickly turned into



a raging inferno, cooking off gas tanks and ammunition alike.

In other words, this was not a good place to be. Also, my arm was on fire.

Injecting your way to a better tomorrow

FC2 takes a rather classical approach to damage and health. You can take quite a lot of punishment before getting taken out, and there are numerous points around the jungles and villages where you can pick up health kits or raid medical cabinets. If you're damaged, you can then use your stored up feel-good drugs and inject a syrette into your arm. It's not too dissimilar to certain reports of Fallout 3, but here the drug you inject is a strictly no-name substance. That said, in World War 2 the emergency syrettes given to Allied GIs contained morphine, the problem drug that saw Fallout 3 originally refused classification.

I guess the ones you get in Africa are filled with pixie dust, or something.

However, there's a whole other mechanic when you do happen to eat too much lead and you're bang out of magical medicine injectors. As you play FC2 you'll make friends - other mercenaries who you might have helped, or who just like a little action every now and then. Each of these friends has a story to tell, and may actually help you out with alternate ways



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to do certain jobs. They also show up to haul your arse out of danger, gunning down anyone nearby, stabbing you with a syrette, and offering you a handgun while you get your bearings.

It's quite possibly the neatest mechanic we've seen to eliminate the immersion breaker that is player death.

Each time this happens you also get a nice tough-guy payoff, as you deal with the wound that took you out in the first place. This can range from using a pair of pliers to pull a bullet out of your hand, ripping a splinter the size of Western Australia out of your thigh, or pulling fiery flare from your abdominal cavity.

Shooting friends and machete-ing people

But all the particle effects, ragdoll physics and collapsing buildings in the world can't help a game if the combat – the core element of any shooter – sucks. Certainly, that's one of the things that let Crysis down. In FC2, the combat

is faster and a lot more chaotic. Badguys can sneak up on you through the brush, or are just as likely to flee and find some mates. The AI can also make more clever use of vehicle weapon-mounts; take out a gunner, and driver is as likely to climb up into the mount, or just get out and start plugging you man-to-man.

You also only get five weapons slots, which is a nice balance between the tactical shooter's typical two, and the more run'n'gun eight or nine. These consist of a machete (the African crowbar, apparently), a pistol, a long-arm, grenades ("Captain won't let me take 'em!") and a special weapon, like an RPG or flame-thrower. The pistols aren't immediately appealing, but given that your weapon can actually jam, and you have to clear it by mashing a key repeatedly, the pistol suddenly comes into its own.

About our only gripe so far is that it's singularly annoying to have to put three or four rifle rounds into someone to drop them. Hopefully there's still some tweaking to go in that respect, but even so the combat is

fast and very engaging, mixing stealth were necessary with all out, guns (and trees) blazing action.

There's obviously work to be done on Far Cry 2 still, but the direction that the game is heading in, and the already impressive polish that the game already boasts suggests this is a game that will be worth the wait. Dare we say it, but this could be the game that Crysis promised to be, and very possibly the finest shooter of the modern era. 

ANTICIPATION RATING

Developer Ubisoft Montreal
Publisher Ubisoft
Website www.farcrygame.com/



Wide open game world; strong physics and flame simulation; varied mission structure



Damage model needs some balancing



Overall:
The proof will no doubt be in the final, blood-soaked pudding, but we're very excited so far...

92%



Soul Calibur IV

Justin Robinson has a look at the game that still can't spell its name correctly.

Soul Calibur has long been a mainstay of console gamers. We at Atomic have sunk immeasurable (and probably unhealthy) amounts of time into the games over many years, and naturally we were excited when we got this one in. Then that excitement turned to something much more, as we discovered it had Vader in it. *Vader*, people!

The story mode of this game, if it can be called that, revolves around two powerful swords. These are called Soul Edge, and Soul Calibur, and are evil and good respectively. Each character has a feebly written introduction story that vaguely describes why they're after the swords, and then the game thrusts you into a series of five battles in seemingly random locations, until a short victory movie plays and you get two lines of text to placate you until you do it all again with another character. Thankfully this isn't that much of an issue, because there are plenty of other game modes to be delved into that offer a more substantial experience.

Dredging this same mode up from the very first game, Arcade mode is a series of battles against eight opponents of increasing difficulty. This is timed, giving you about 80 seconds per opponent, with two victories per opponent moving you along. At the end of these battles, you're rewarded with a new character, as well as money. A significant portion of the singleplayer game is actually spent playing this now ancient mode, but the incredibly detailed fighting arenas and character models keep it from becoming tedious.

The game's creators have at least introduced something new into this rehashing of older playing modes, in the form of the Tower of Lost Souls. This is similar to both the other

modes, but is a series of three or four fights against multiple enemies, using more than one character. The damage in this mode is persistent for each floor, so if you lose a character against one of the enemies you won't be getting them back until you reach the next floor. We like this mode, as it introduces a breath of fresh air into the stale "press X to win" style gameplay, and forces you to think about character choices and tactics. The Tower also introduces task-specific rewards, such as successfully throwing an opponent out of the ring during a battle, or performing a specific move. This unlocks special armour, weapons and clothing, all of which can be added to your characters to customise and improve them.

All the main characters that were included in the previous games are available to modify, as well as a few new entrants. Sadly, you can't dress Vader up in a large purple dress with a fighting umbrella (funnily enough one of the characters actually uses one of these), as he is locked into his dark outfit. Changing a character's clothes not only makes them look better or worse, but also improves their statistics in terms of damage dealt and amount of punishment they can take before succumbing themselves.

There is a lot of action in the singleplayer arena, but it's let down by the repetitive and predictable computer AI. Multiplayer is where the game really shines, so another controller was given to a Dave at random, and we chose our characters and faced off in battle. The experience was very different, and was almost like a completely different game – one that was unexpected and fun. From throws to punches, kicks and blocks, the real meat of the game can be found in this mode. Either physically or online, multiplayer is the main avenue for



showing off your custom characters, fighting prowess, and the impressive amount of hours that you've sunk into the game thus far.

You can even participate in online tournaments, with a ranking that goes up and down to show all your friends (or spouse, girlfriend, neighbour, ancestors etc) just how damn impressive you are.

All in all, this is a solid offering that looks very nice and has enough content to keep you playing for a few weeks, but at the same time we have to admit it doesn't bring enough to the table to really change the game at the core. (C)

PS3 / 360 (tested on PS3)

Developer Project Soul
Publisher Ubisoft
Website soulcalibur4.namcobandaigames.com/

Graphics
At last - real boob physics!

84

Gameplay
You hit, and hit, and hit hit hit hit.

82

Sound
Definitely the game's weakpoint.

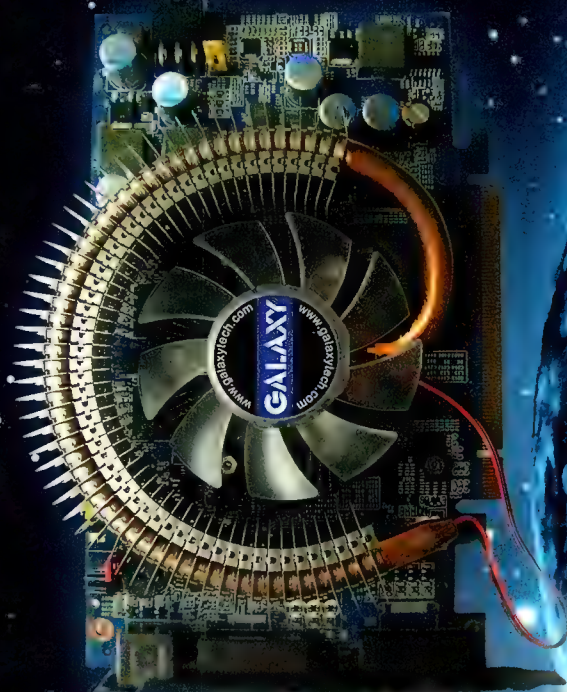
69

Overall
This is a tried and true game that we really can't dislike.

84%

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The Force Unleashed

After the preview, comes the real thing – is it worth the hype?

Last issue we had some hands-on time with a preview build of *The Force Unleashed*, and we were damn excited. Since then we've spent a lot more time with the retail version of the game, and that excitement was not unfounded.

If you read last month's preview then you know the story, but to recap, you play a secret apprentice of Darth Vader's – your existence is hidden even from the Emperor. Vader is still hunting down the last few surviving Jedi, and that's where your first few missions come in.

Each level takes you to a different planet, all geographically unique in true Star Wars style. There's the trash planet, the gas giant planet, and so on. Combined with the advanced physics of the games, each locale offers some truly unique situations. From Force-throwing badguys through the lush undergrowth of Felucia, to smashing flying TIE Fighters with crates in a fighter production facility, this is a game where the advanced physics adds not only to the gameplay, but to your sense of character.

The Force Unleashed is not just about throwing stuff around with the Force; it's also one of the better Star Wars stories to be told in recent times – better, certainly, than anything George Lucas has been responsible for in recent years. There's some solid voice work in the game, too, and a lot of the character designs have been taken from the actors playing them, like Starkiller himself, who is voiced by Sam Witwer. If the Sith Apprentice looks familiar, it's probably because you've seen him in *Dexter* and the new *Battlestar*.

The entire package of Force-based gameplay, advanced physics, and excellent storytelling comes together to deliver a compelling experience, and not just to the player. Every time we sat down for a session, colleagues from our office downed tools to come watch the game unfold. On a hi-def TV and with a good sound system, *The Force Unleashed* a better Star Wars experience than most of the movies.

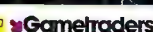
Take that George! 



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Fracture [PREVIEW] multiplayer

David Hollingworth spent some quality terraforming time with LucasArts' newest property.

Coming up with a new gimmick in a first person shooter is a lot like trying to re-invent the wheel. Oh sure, the history of the wheel is complete with great additions, like tyres to grip the road, breaks to slow you down, and Top Gear. And yet the wheel is still essentially a round thing that rolls you from place to place.

Similarly, while FPS games may have been improved by things like one-shot-kills in tactical shooters, regenerating shields in games like Halo and dirty smack talk in *Counterstrike*, really, it's still about shooting people in the face. LucasArts, however, feels that they are indeed bringing something new to the FPS table with Day 1 Studios' *Fracture*.

Fracture is the first new intellectual property to come out of LucasArts in some time, and it is being heavily hyped. One of the game's key features is the deformable terrain, and before you all yell "RED FACTION, n00b!", let me quickly say that *Fracture* does in fact go one step further. Not only can grenades and missiles cause craters and such, but you have a special tool – the 'trencher' – that can drop or lower the level of the surrounding terrain.

We only played multiplayer, as I said, but by way of background, essentially, the world has gone to environmental shit. Rapid terraforming technology is the only thing keeping civilisation's head above water (literally), and it has of course become weaponised. On top of that, the US has split into two factions – one embracing genetic fiddling and the other proudly siding with a more cybernetic solution. That sets the

stage for the single player game, and sets up two sides for any team-based mayhem.

On with the show!

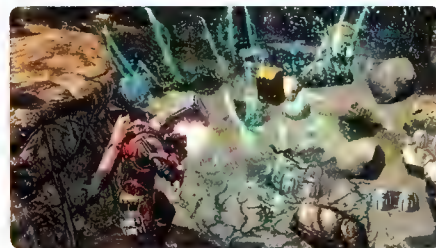
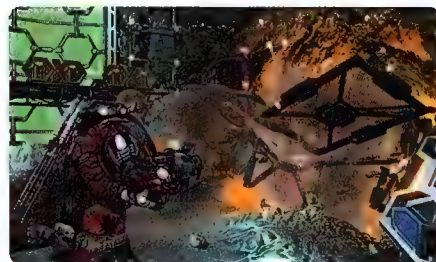
All the usual multiplayer modes are present in *Fracture*, from deathmatch and team deathmatch to capture the flag and the now popular king of the ever-moving-hill. One unique game mode also makes use of your digging ability, requiring you to seek out and dig up objectives, and then hold them to score points.

Of course, the big draw is in the fact that no map will ever survive contact with the terrain-deforming enemy. It sounds great on paper, offering up new emergent gameplay and promising that no map will ever play the same twice. In actuality... well, not quite.

We will admit, there were some great moments in our playtime. Case in point was in one CTF map, where we discovered that you could block all the routes into our flagbase – bar one – by raising the ground up to block doorways. It forced the opposition to either storm our base by one very covered entrance, or dig their way in. It was a tense stand-off, and a lot of fun.

On the whole, however, all the terrain raising and dropping simply turned every map into a similar array of canyons and rocky hills that slowly chokes up the map and reduces each game to a close-range slug fest.

Some interesting weapons do make a welcome appearance, though, from tunneling missiles that you can detonate at will to multiple grenade launchers that let you stagger the explosions to greatest effect. But regardless



of the effect on the terrain, no one weapon really seems to cause that much damage – the action has a real old-school, *Doom*-style feel to it. Raising the terrain under someone's feet may fling them in the air if you can time it right, or at least spoil their aim, but it's still time wasted as you really need to keep weapons on target at all times to have any hope of delivering the hurt.

This lack of real lethality may change before release, but our initial forays into the game have not left us with a great deal of excitement. There's nothing we love more than being surprised, though. ☹

ANTICIPATION RATING

Developer Day 1 Studios
Publisher LucasArts
Website www.fracturegame.com/



Unique weapons; varied maps; emergent tactics



Maps become very samey after five minutes of play; weapon damage too low



Overall

We're still waiting to get excited about *Fracture* – maybe the single player will do the trick?

67%



Director Guillermo del Toro;
Starring Ron Perlman, Selma Blair, Doug Jones,
 Jeffrey Tambor, Luke Coss
Distributed by Universal Studios

There are few directors around who can handle the wildly careening shifts in tone that Guillermo del Toro seems to be making his trademark. From moody genre pieces, del Toro has risen to vast cinematic heights with films like *Pan's Labyrinth* and producing the horror hit *The Orphanage*,

secret as possible. Suffice to say, in one of many excellent set piece action scenes this secrecy is blown wide open.

That friction in Hellboy's private and professional life is set against the larger and more dangerous backdrop of the return of an elfen prince who has sworn to destroy humanity so that his people can once again take their place ruling the world above ground.

As an effects film and a genre piece, it's a real rollercoaster ride. It's not so... weighty as the first film, relying instead on more humour and greater



"... it's also a wonderful companion piece to the more somber *Pan's Labyrinth*, hinting that the world the two films inhabit is the same one."

yet he still has time for what seems like cotton-candy attractions like *Hellboy*. But thinking this is lighter fair compared with the meatier subjects he's covered does both the director and the film itself a dis-service.

Hellboy 2: The Golden Army takes up where the previous *Hellboy* ended. He's still madly in love with the fire-throwing Liz, though the relationship isn't as smooth as he would like. Similarly, he's still chafing under the need for him and the organisation he works for - Bureau for Paranormal Research and Defense - to stay as

narrative pace, and it does lose something in that tonal shift. But it's still a great film which advances nearly all the characters quite a lot.

What's more, it's also a wonderful companion piece to the more somber *Pan's Labyrinth*, hinting that the world the two films inhabit is the same one. *Hellboy's* world is one of surface normality, underneath which lurks all the joy and horror we find it more convenient to forget, but that makes life still vastly more rich than we have made it. Del Toro's real skill comes in weaving such fairy-tale like fables in with the

big explosions and men in rubber suits (which, however, are some of the best animatronic effects we've seen).

And, like *Pan's Labyrinth* again, this is a story about finding peace through refusing to do what you're told. Kind of like Guillermo himself, and if he can bring this richness to *The Hobbit*, then it looks like there are good cinematic times ahead. 





L: Change the World

Director Hideo Nakata

Starring Kenichi Matsuyama, Narushi Fukuda, Mayuko Fukuda, Shingo Tsurumi, Youki Kudoh

Distributed by Madman Entertainment



change the World

Back in issue 91 we had a look at the first two live action movies based on the Death Note anime and manga. Those two films were a huge success in Japan, and we really quite liked their brief but well executed take on the series. Success is a dangerous thing, though, as it can often

breed unlooked for and un-necessary sequels. Like *L: Change the World*.

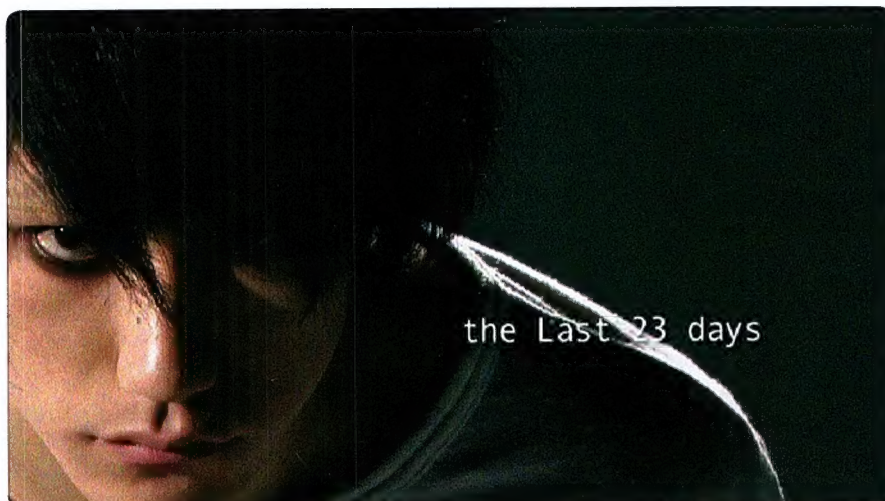
Now, you might be thinking, didn't something happen at the end of the second film that might preclude the making of a third? Well, yeah, but that's handled early on in *Change the World*'s setup – not deftly, mind, but enough that we can get over the apparent incongruity and on with the latest disaster to beset humanity. A disaster that, of course, only L can handle.

Which of course brings us to another incongruity – when the world is faced with a

rampant disease decimating the population, why turn to an eccentric crime fighter?

The big problem with the film is that it seems to exist only to cash in on the popularity of the first two *Death Note* films, and mine the charisma of the actor playing the lolly-eating lead. And that would be fine... Kenichi Matsuyama certainly does a good job with the scant material available, but the director wastes a lot of other good characters and opportunities.

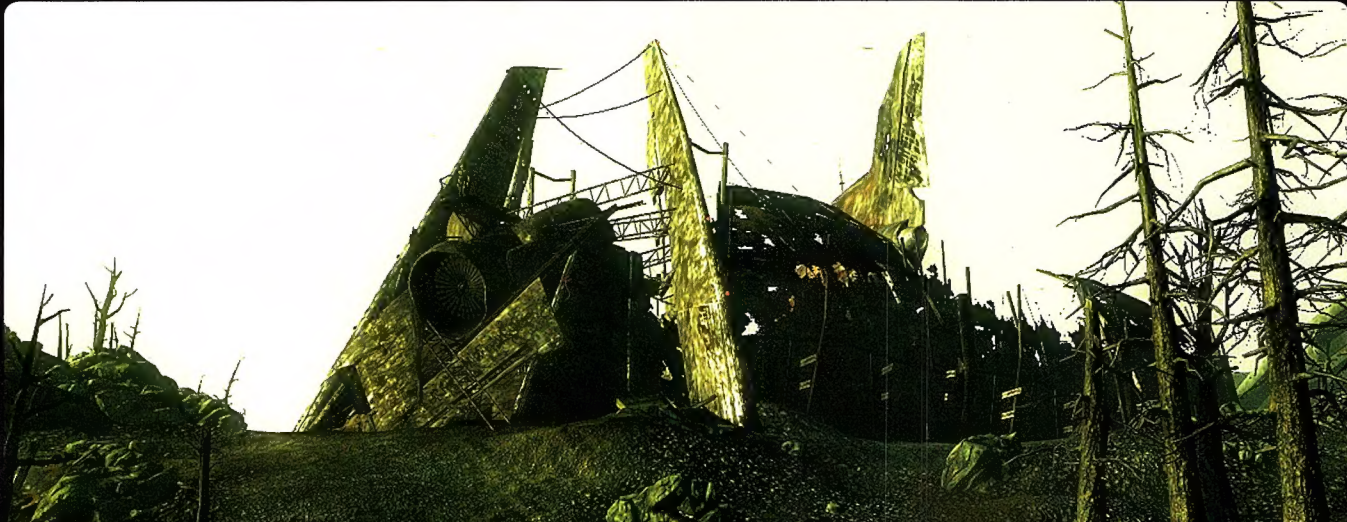
In fact, the movie too often falls on cheap horror for its shocks, with hideous infected and other B-grade tropes. Fans might go for it for completeness' sake, but overall this is a film that's hard to recommend. 



Overall

Wasted opportunities and horror clichés pull down the few highpoints of this film.

56%



Classification X: Part 1

Logan Booker doesn't want his package restricted.

Shadows. All Max could see were shadows. Okay, maybe it wasn't all he could see. Obviously, the rough, pock-marked surface of the asphalt his feet were currently using was visible, as were the looming brick walls either side of him. They formed what one would describe as an alley, but all Max could think about was how enclosed it all was.

A noise. To his left. It was enough to make Max stop.

The sound of his breathing echoed in his ears like a wallaby's snore. He tried to calm himself, taking tiny snorts of air through his nose, and forcing them out his mouth through his teeth. The resulting effect would have reminded Max of an effeminate asthmatic wombat, if such a poor creature existed, and Max had been subjected to an evening of vodka and oxygen shots with it.

It had been several moments, and Max still had no idea what had caused the noise of concern. He had to keep moving. Grasping the bundle in his hands closer to his chest, he moved down the alley at a brisk pace, and attempted to block

the outside world from his senses.

And that was what this was all about, Max mused. The paranoia. The hysteria. The lonely nights in the cupboard with a torch and three McVitie and Price. He hated those biscuits now.

Two days he'd spent cooped up in his cubby hole, his little coven. He'd waited, silently, for the boots to pass, for the voices of angry men and dogs to subside. Two days it had taken for an appropriate amount of audible nothing to pass. Then, and only then, did Max make a break for his house.

He was two-thirds of the way there, and he still had a few hours of night to burn. Things were looking up, much like the way a dog can't. Yes, *things were looking up*.

A crash, a bang. Max stopped again. No, it was definitely a real noise, not those fake ones his doctor kept telling him about.

Run, his frontal lobe screamed. *Stand there and look like a constipated kangaroo*, his parietal lobe bellowed. *What's with all the marsupials?*, his temporal lobe questioned with its raspy, platypus-like quack.

Enough!, he mind-yelled. *Enough*. Max broke out into a gallop.

Horses, that's better, his temporal lobe said with some satisfaction. Max slapped it.

The noises returned. Max secured his package, and then made his grip firmer on the bundle at his chest. With nothing left to procrastinate with, he ran some more.

Flashlights flickered over his shoulders and through his flailing limbs, casting frightening and mutated apparitions on the alley walls. The barking of dogs flooded the air, and the calls of men buzzed like bees at his ears.

A force smashed against his back; a powerful, furry explosion that felt like a yeti had taken a swing at his head and found his spinal cord instead. Max tumbled to the ground, and his bundle came loose. It briefly spun across the ground like a badly-thrown Frisbee before coming to a stop. Unsurprisingly, the flimsy black plastic that had protected it was now torn, exposing its contents for the world to see.

It was a box. A box with two words.

Fallout 8. 



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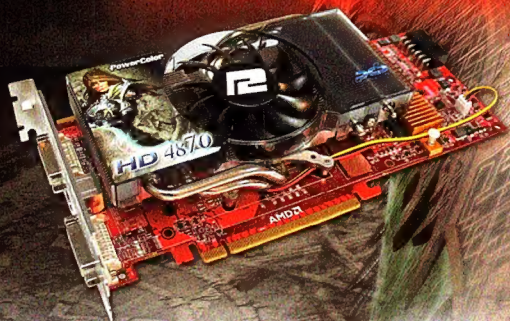
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C/P Ratio (benchmark: 3D Mark vantage)



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